Fluids and Combustion Facility (FCF) Fluids Integrated Rack (FIR) Hardware Interface Control Document

International Space Station Program

Revision B

March 2011

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International Space Station Program
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ERU: /s/Beth Mason 5-25-11

INTERNATIONAL SPACE STATION PROGRAM

FLUIDS AND COMBUSTION FACILITY (FCF) FLUIDS INTEGRATED RACK (FIR) HARDWARE INTERFACE CONTROL DOCUMENT

MARCH 2011

PREFACE

This Interface Control Document (ICD) is the exclusive document used jointly by the National Aeronautics and Space Administration (NASA), and the Fluids and Combustion Facility (FCF) Fluids Integrated Rack (FIR) payload developer to identify and establish the pressurized payload physical / functional interfaces. This document contains the design implementation of the interface requirements in SSP 57000, Pressurized Payloads Interface Requirements Document (IRD). Both sides of the interface are described and include mechanical, structural, electrical, avionic, and functional interfaces. The interfaces outlined in this document are mandatory and may not be violated unless specifically agreed upon by the Payloads Control Board (PCB). This document is under the control of the Payloads Control Board, and changes or revisions will be approved by the PCB.

APPROVED BY:	/s/ William R. Jones	4/27/11
	William R. Jones II Manager, Space Station Payloads Office NASA/OZ	Date

INTERNATIONAL SPACE STATION PROGRAM

**FLUIDS AND COMBUSTION FACILITY (FCF) FLUIDS INTEGRATED RACK (FIR)
HARDWARE INTERFACE CONTROL DOCUMENT**

MARCH 2011

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INTERNATIONAL SPACE STATION PROGRAM

**FLUIDS AND COMBUSTION FACILITY (FCF) FLUIDS INTEGRATED RACK (FIR)
HARDWARE INTERFACE CONTROL DOCUMENT**

MARCH 2011

CONCURRENCE (CONTINUED)

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INTERNATIONAL SPACE STATION PROGRAM

FLUIDS AND COMBUSTION FACILITY (FCF) FLUIDS INTEGRATED RACK (FIR) HARDWARE INTERFACE CONTROL DOCUMENT

MARCH 2011

LIST OF CHANGES

All changes to paragraphs, tables, and figures in this document are shown below:

SSCD	ENTRY DATE	CHANGE	PARAGRAPH(S)
007762	05/04/03	BASIC	ALL
011274	09-30-08	REVISION A	
		57218-NA-0004	3.6.1.1, 3.6.1.2 **TABLE(S)** 3.6.1.2-1, 3.6.1.2-2, C-1, C-2
	08-27-03	57218-NA-0005	**PARAGRAPH(S)** 3.3.2.1, 3.3.3.2 **TABLE(S)** 3.3.2.1-1, 3.3.3.2-1, C-1
	08-22-03	57218-NA-0006	**PARAGRAPH(S)** 3.2.6 **FIGURE(S)** 3.2.6-1, 3.2.6-2 **FIGURE(S) ADDED** 3.2.6-3 **TABLE(S)** C-1

SSCD	ENTRY DATE	CHANGE	PARAGRAPH(S)
	06-23-04	57218-NA-0007	2.1
			TABLE(S)
	09-30-05	57218-NA-0011	4.2-1
			PARAGRAPH(S)
	07-18-08	57218-NA-0022	3.1.1.1, 3.1.1.3, 3.1.1.3.1, 3.3.1, 3.3.4.2, 3.9.1, 3.9.1.1, 3.9.1.2, 3.9.1.3, 3.9.2.1, 3.9.2.2, 3.2.7, 3.3.1, 1.4.1.2
			FIGURE(S)
			3.1.1.1-1, 3.1.1.3-2, 3.1.1.3-1, 3.3.1-1, 3.2.7-2, 3.3.1-2, 1.4.1.2-2
			TABLE(S)
			3.9.2.1-1, 3.9.2.2-1, C-2, C-3
	07-29-08	57218-NA-0023	5.1-1, 4.2-1
			Section 5.2
			PARAGRAPH(S)
012773	April 2011	57218-NA-0024	3.1.1.2, C-1
			PARAGRAPH(S)
		57218-NA-0025A	4.3
			TABLE(S)
			4.2-2, 4.3-1, 4.3-2, 4.3-3

SSCD	ENTRY DATE	CHANGE	PARAGRAPH(S)
		57218-NA-0026	4.3.1
			TABLE(S)
			4.2-3, 4.3.1-1
			TABLE(S)
		57218-NA-0027	4.3-1, 4.3-3
			TABLE(S)
		57218-NA-0028	3.3.5.2-1
			PARAGRAPH(S)
		57218-NA-0029	4.3, 4.3.2
			FIGURE(S)
			4.3.2-1
			TABLE(S)
			4.2-2, 4.3.2-1
			PARAGRAPH(S)
		57218-NA-0030	4.3
			TABLE(S)
			4.2-4
			TABLE(S)
		57218-NA-0032	4.3-1
			PARAGRAPH(S)
		57218-NA-0033	2.1.1, 4.3, 4.3.2.1, 4.3.3

SSCD	ENTRY DATE	CHANGE	FIGURE(S)
			4.3.2-1, 4.3.2.1-1, 4.3.2.1-2. 4.3.3-1, 4.3.3-2
			TABLE(S)
			4.2-5, 4.3-3, 4.3.2-1, 4.3.2.1-1, 4.3.3-1
			TABLE(S)
		57218-NA-0034	3.3.5.2-1
			FIGURE(S)
		57218-NA-0036	4.3.2-1
			TABLE(S)
			4.2-5, 4.3.2.1-1
			PARAGRAPH(S)
		57218-NA-0037A	4.3
			TABLE(S)
			4.3-1, 4.3-2, 4.3-3, 4.3.2-1, 4.3.2.1-1, 4.3.3-1
			TABLE(S)
		57218-NA-0038	4.2-5, 4.3-3
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SSCD	ENTRY DATE	CHANGE	TABLE(S)
		57218-NA-0040	4.2-1, 5.1-1

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1.0 INTRODUCTION

1.1 PURPOSE

This Interface Control Document (ICD) is the primary source of design implementation and module specific interfaces of the Pressurized Payload Interface Requirements Document (IRD). This Hardware ICD controls the ISS and Fluids and Combustion Facility (FCF) Fluids Integrated Rack (FIR) interfaces for integration into the United States Laboratory (USL) and the Multi-Purpose Logistics Module (MPLM). The physical, functional, and environmental design implementation associated with payload safety and interface compatibility are included herein.

1.2 SCOPE

The interfaces defined in this document apply to transportation and on-orbit phases of the payload mission cycle for the FCF FIR. Transportation interfaces are specific to the MPLM. The reader is referred to SSP 52000-IDD-ERP, EXPRESS Rack Payloads Interface Definition Document, for requirements related to transportation in the Shuttle Middeck area.

ARIS optimal performance is defined in SSP 57005 Active Rack Isolation System to Pressurized Payload Interface Control Document.

1.3 USE

Section 3.0 of this document contains the FIR design implementation and module specific interface information while Section 4.0 has an applicability/verification matrix that provides traceability back to the specific interface design requirements applicable to the FIR contained in SSP 57000, the Pressurized Payload Interface Requirements Document (IRD). The specific verification methods for each IRD interface design requirement are also documented in the applicability/verification matrix. The FCF project will be responsible for providing the specific FIR interface information in Section 3.0 for each applicable interface as well as identifying all applicable IRD requirements for that interface in the applicability matrix contained in Section 4.0. In addition, Section 5.0 contains a table the FIR Project will utilize to document exceptions to the applicable requirements in SSP 57000 or the module specific interfaces defined in SSP 57001. The FCF project will be responsible for providing any analysis or documentation required to evaluate and disposition identified exceptions to the IRD. Figure 1.3-1, Payload Interface Requirements and Control Process, shows the inter-relationship of the IRD, ICD Template, and the FCF FIR Hardware ICD.

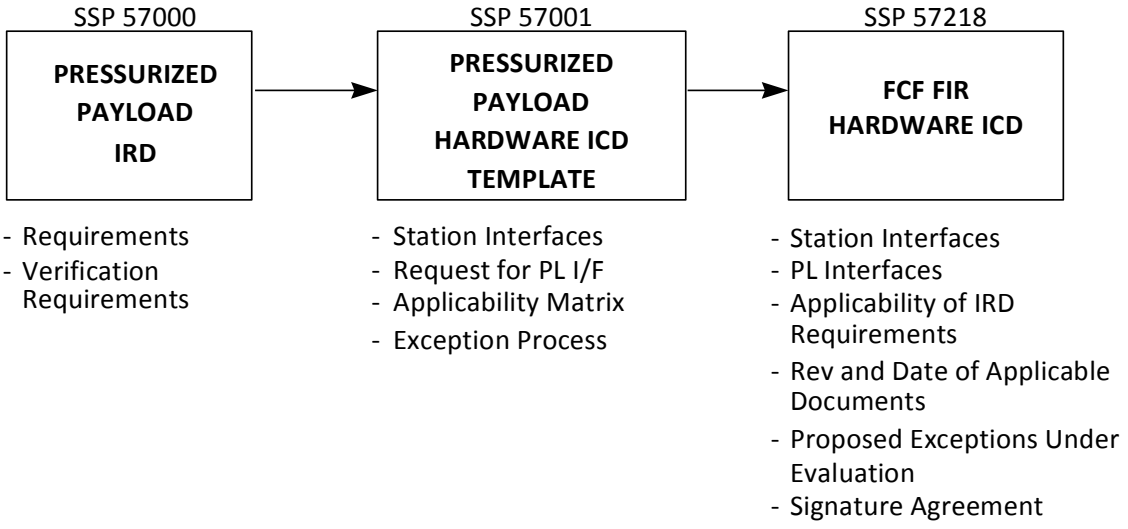


FIGURE 1.3-1 PAYLOAD INTERFACE REQUIREMENTS AND CONTROL PROCESS

1.4 PAYLOAD OVERVIEW

The FCF is a modular, multi-user facility designed to accommodate fluids and combustion experiments on board the USL Module of the ISS. The primary mission of FCF is to support accomplishment of National Aeronautics and Space Administration (NASA) John H. Glenn Research Center (GRC) / Microgravity Sciences Division (MSD) Program objectives requiring sustained, systematic microgravity fluid physics and microgravity combustion science research on board the ISS. The extended duration microgravity environment of the ISS will enable microgravity research to enter into a new era of increased scientific and technological data return. The FCF is being designed to increase the amount and quality of scientific and technological data, while decreasing the development cost of individual experiments relative to other avenues of performing such experiments.

The FCF will occupy two International Standard Payload Racks (ISPR) to provide the common on-orbit infrastructure needed by the fluids and combustion disciplines and on-orbit accommodations for the experiment-specific hardware needed by individual fluids and combustion scientists.

The initial deployment of FCF will be the launch of the Combustion Integrated Rack (CIR), which will function independently as a single integrated rack allowing for early science research opportunities while accommodating ISS launch manifests and resource availability. The final deployment of the FCF will occur with the launch of the FIR, which will also function independently as a single integrated rack. Once the two racks are completely installed on-orbit, approved upgrades will be performed to offer enhanced capabilities to meet the full set of facility science requirements.

1.4.1 GENERAL PAYLOAD DESCRIPTION

1.4.1.1 SCIENCE CAPABILITY

The ISS FCF is a multidiscipline research facility that provides accommodations to investigate combustion and fluids phenomenon in a sustained microgravity environment. Investigations performed in a microgravity environment provide unique insight into the behavior of fluids and combustion science. The combustion portion of the FCF supports investigation and observation of laminar flames, turbulent combustion, droplet and spray combustion, and other types of combustion research. The fluids portion of the FCF supports investigation and observation of multiphase flows, boiling, condensation, colloid physics, surface tension controlled flows, and other types of fluid physics research.

Hardware developed for a Principal Investigator (PI) is the key to FCF adaptability. Experiment-specific components are individually engineered for each new experiment (or group of experiments). These unique components customize FCF to perform experiments in the most effective way.

The FCF is being developed to allow for a three-tier approach to performing science experiments. Tier 1 is the common platform providing the basic infrastructure for all FCF experiments. This platform includes all the services required by the experiments, such as power and thermal control as well as data acquisition and control. Tier 2 is a multi-user insert that can be used for multiple experiments of sufficient commonality. The inserts can be designed for a specific sub-discipline and used several times with minimal modifications between experiments. Tier 3 has the PI-unique equipment that must be built and launched for each experiment. This equipment will include special diagnostics or avionics, as well as test samples or consumables. However, once on-orbit, that equipment may be reused or added to the capability of FCF or the multi-use inserts.

To meet the FCF requirement of conducting at least 10 typical PI's experiments per year, FCF is designed to reduce PI's hardware mass and cost. This design is feasible because FCF keeps commonly used hardware permanently on-orbit (e.g., cameras, computers, actuators, combustion chamber, optical fixtures, light sources) and has permanent ground facilities for use by any PI. PI's provide only those items which are unique to their experiment.

1.4.1.2 FLIGHT SEGMENT

The Flight Segment includes the CIR and FIR racks which will be installed in the USL. These racks will provide the resources needed for PI's to conduct the actual flight experiments in microgravity conditions. In addition to providing specific hardware and resources for combustion science experiments in the CIR and fluids science experiments in the FIR, the two FCF racks incorporate the shared functions listed below:

- Power control and distribution equipment
- Environmental controls including air and water cooling and fire detection and suppression
- Command, data management, image processing, and communication hardware and software

The FCF utilizes design commonality across the two racks in the following subsystems:

- Structure
  - Rack Door
  - Optics Bench Attachment Hardware
  - Optics Bench Slides and Pins
- Electrical
  - Electrical Power Control Unit (EPCU)
- Command and Data Management
  - Diagnostic Control Module (DCM)
  - Input/Output Processor (IOP)
  - Common Image Processing and Storage Units (IPSU)
- Environmental Control System (ECS)
  - Air Thermal Control Unit (ATCU)
  - Water Thermal Control System (WTCS)
  - Fire Detection and Suppression System (FDSS)
  - Gas Interface System (GIS)
- Space Acceleration Measurement System (SAMS) Triaxial Sensor Head (TSH)

The FIR, the final FCF element to be launched, accommodates a wide variety of microgravity fluid physics experiments on board the ISS. The FIR concept has evolved over time to provide a flexible "optics bench" approach to meet the wide variety of anticipated research needs. The FIR system architecture is designed to meet the needs of the fluid physics community while operating within the constraints of the available ISS resources. The FIR concept is based on a "carrier" approach that provides common services needed by nearly all fluid physics researchers to minimize the hardware required to be developed and launched for each experiment. Since a majority of hardware is reused, the FIR concept saves development costs, total up mass, and crew time required to perform the experiments.

The FIR system has the following unique subsystems determined to be essential to fulfill the requirements resulting from the initial complement of microgravity fluid physics experiments:

- Optics Bench Assembly
- Atmospheric Monitoring Assembly (AMA)
- Interfaces to accommodate PI-provided diagnostics
  - IEEE 1394 (Firewire)
  - Serial Data Link (SDL) camera interface
  - RS-170A camera interface
- FIR-Specific Diagnostics
  - White Light Package
  - Neodymium (Nd): Yttrium Aluminum Garnet (YAG) Laser Package
  - Color Camera Package
- Active Rack Isolation System (ARIS) (standard configuration)

Figure 1.4.1.2-1, Fluids Integrated Rack Subsystems, identifies the components located in the FIR.

Figure 1.4.1.2-2, ARIS Equipped ISPR, shows an ARIS-equipped ISPR.

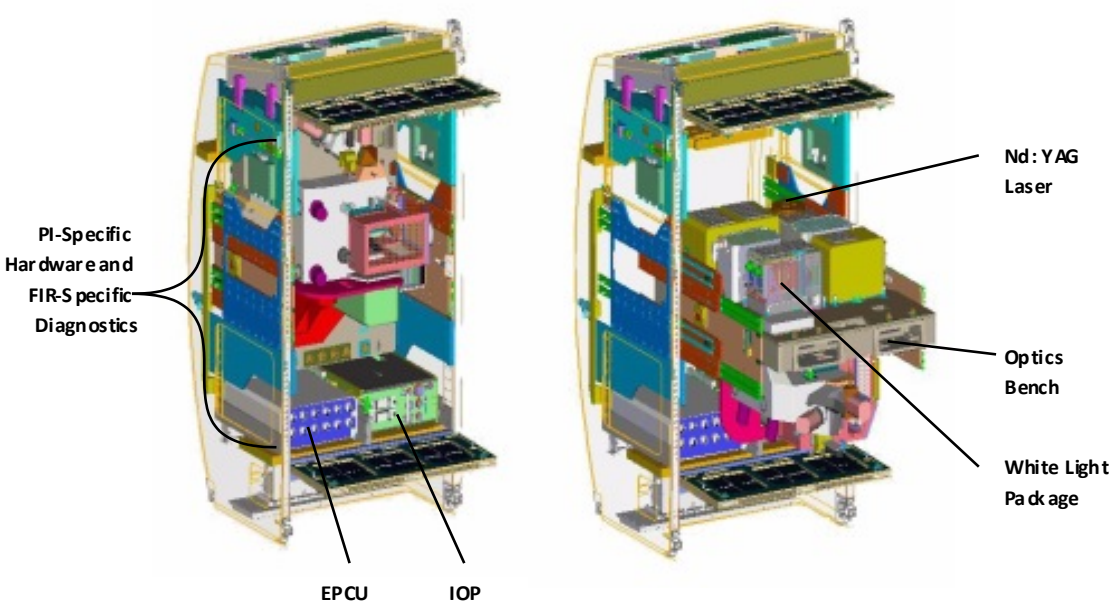


FIGURE 1.4.1.2-1 FLUIDS INTEGRATED RACK SUBSYSTEMS

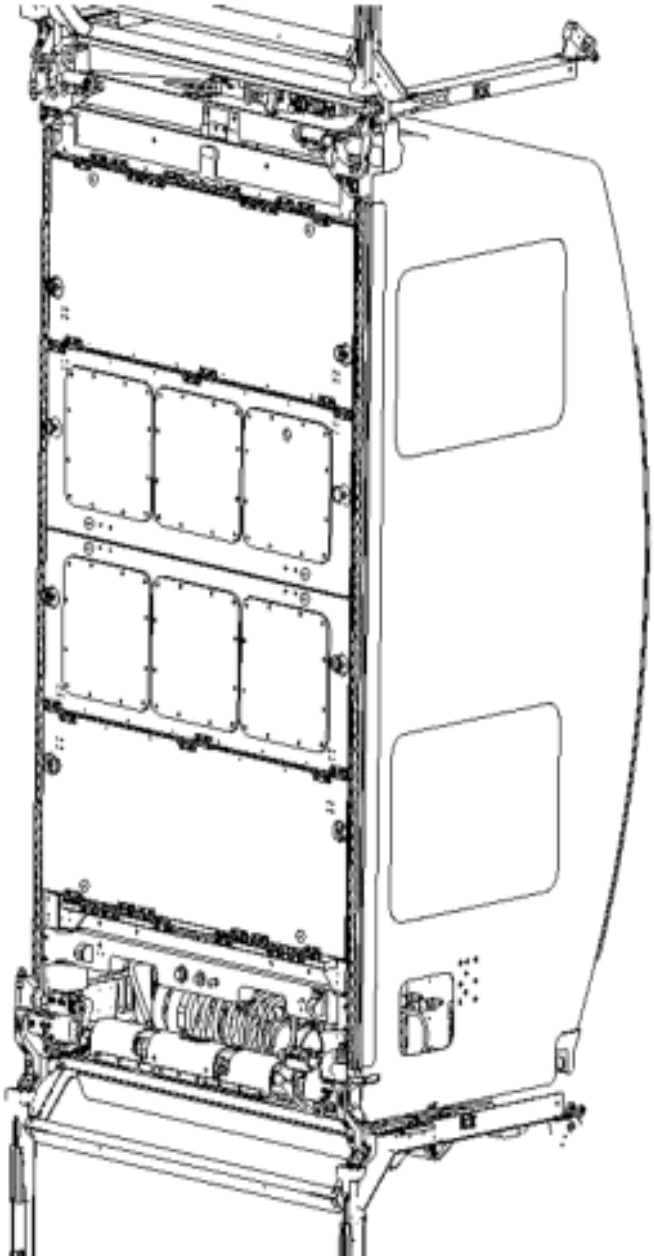


FIGURE 1.4.1.2-2 ARIS EQUIPPED ISPR
(SHEET 1 OF 2)

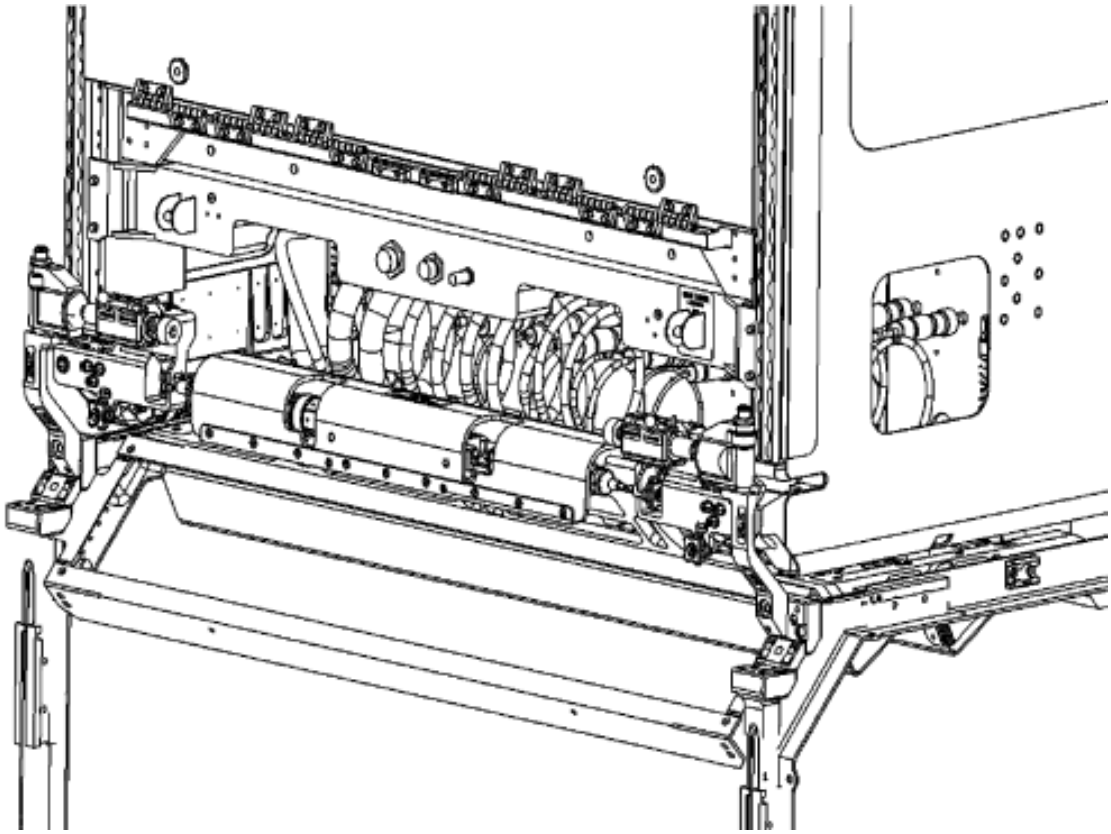


FIGURE 1.4.1.2-2 ARIS EQUIPPED ISPR
(SHEET 2 OF 2)

1.4.2 PAYLOAD OPERATIONS

The FCF is operated by both the crew and ground operations personnel. The crew sets up and prepares the FCF payloads for semi-automated operations. Experiment setup involves installation of PI-unique hardware and samples and reconfiguration of the diagnostics. The crew also performs maintenance and upgrades to the facility. Once the FCF racks are on-orbit, crewmembers will perform all physical operations related to installation, configuration, and maintenance of the rack and PI hardware. The ground team will remotely conduct most of the experiment operations after physical operations performed by the crew.

1.4.2.1 ON-ORBIT OPERATIONS

Upon initial arrival of FIR on-orbit, the crew will transfer the rack from the MPLM into the USL module of the International Space Station (ISS). Using the installation and setup procedures, the crew will install the rack in the USL module and install ARIS. The crew will then populate the rack with additional hardware that was not installed in the rack for launch, such as diagnostics, consumables, and any PI-unique hardware as needed to carry out the science of a specific PI. For FIR, this will include installing or reconfiguring the fluids diagnostics hardware on the FIR optics bench.

With the hardware installed and the rack doors closed, the FIR is prepared for on-orbit checkout. The FIR will be verified for operations by a series of tests and calibrations controlled by ground command, crew action, automated sequence, or a combination thereof. After on-orbit checkout is complete and any necessary adjustments or changes are made to the system, the FIR is ready to be used for science operations.

The experiment will typically be run with pre-programmed routines and commands from the ground teams. A run includes setup, science event, data collection, and reconfiguration. The typical fluids experiment may take anywhere from 8 hours to 30 days to be completed. Note that many of the fluids experiments continue to "operate" passively in the absence of external power (i.e., colloidal physics experiments). FIR science sample changeout may require crew interaction.

A microgravity environment is required during the experiment operation period. During the normal operating period, the ISS crew will have minimal involvement in the actual execution of an experiment. Operations of the experiment will be primarily conducted from the GRC Telescience Support Center (TSC). Remote PI sites will be provided with the necessary data to manage and monitor the experiment executions. The ISS crew, however, will have the ability to communicate and control the experiments using the Station Support Computer (SSC) with the help of the ground operation team. When an experiment run is complete, the rack will be saved and powered down, possibly requiring crew involvement.

From the TSC and remote sites, the PI will work with the FCF Operations Team during experiment operations. Based on the Short-Term Plan (STP), the FCF Operations Team will coordinate the initial power up of the facility with the Payload Operations and Integration Center (POIC) and the ISS crew. Once the facility rack is powered and checkout is completed, the FCF and PI teams will uplink the desired commands for the experiment. As the experiment proceeds, the FCF and PI teams will monitor the downlinked video and data to ensure that the experiment is proceeding as planned. If problems are encountered, the teams will work together with the POIC and crew to resolve them. At the end of a day, upon completion of a series of test points, or completion of an experiment, the FCF Operations Team will uplink commands to terminate the experiment and power down the rack. The FCF Operations Team will coordinate with the POIC any crew action needed in the shutdown or completion of an experiment or test point. When the experiment is complete, the experiment hardware will be removed from the facility and put into the stowage lockers to be returned on a following logistics flight.

The ISS crew will perform all regular and unscheduled maintenance activities. On-orbit maintenance of the FIR will center on the removal and installation of Orbital Replacement Units (ORUs). Maintenance activities also include cleaning and calibration to ensure proper system operation during scientific experiments. The preferred time for these activities will be during non-microgravity days or other downtime when the FIR is not scheduled to be utilized, which allows maximum availability of the FIR for science during available microgravity periods.

1.4.2.2 GROUND OPERATIONS

The FCF ground operations consist of all the ground activities required to support the on-orbit operations, including coordination of on-orbit procedure execution, real-time procedure

generation, command generation and uplink, communication with the POIC cadre and ISS crew, and engineering and science data monitoring and analysis.

The FCF operations team, in conjunction with the PI team, will support the performance of procedures required for the installation, checkout, and nominal operations of the FIR. This support will be accomplished by monitoring air-to-ground communication and downlink video of crew activities and working with the POIC to provide technical support to the task.

Real-time procedure generation takes place when an off-nominal operation needs to be done by the crew and no procedure has been developed. In this case the ground operations team will consult with the engineering team and the POIC to develop the required procedure using the FCF Ground Integration Unit (GIU) as the development platform.

The FCF ground operations team will generate all commands needed to operate the FIR on-orbit system and coordinate with the POIC for uplink. Alternatively, FCF may provide the command via voice communication to the crew instructing them to issue commands via the SSC. The FCF Ground Segment, in combination with the TSC, will have the necessary tools to generate the commands and to update the command database as required.

The most important ground operation will be providing console support during real-time usage of the FIR, monitoring the facility engineering and science data, which will be accomplished using the TSC as well as FCF-provided tools. The FCF team will monitor the engineering data to track the health of the facility. They will also ensure that the PI teams are receiving their desired science data. All data will be stored for later analysis and distribution.

Mission planning during an increment will consist of updating the current STP and Onboard Operations Summary (OOS) by submitting planning requests through either the Payload Information Management System (PIMS) or the Payload Planning system. The ground team will also participate in the daily science tag with the Lead Increment Scientist (LIS) and/or LIS representative to establish the execution priorities not captured in the STP or OOS. All interactions with the POIC will be by voice loop/teleconference. Planning requests will be submitted through the PIMS.

2.0 DOCUMENTATION

The following documents, of the specific revision and date indicated, identify the specifications, models, standards, guidelines, handbooks, and other special publications applicable to the FCF. The documents in this section are inclusive to those specified in this document and form a part of this specification to the extent specified herein. The FCF Project Office will be responsible for impacting any changes processed as ISS Payload Office Preliminary Interface Revision Notices (PIRNs) to these applicable documents and report to the ISS Payload Office as to whether the changes impact them. Changes that impact integrated rack development will be handled with either a waiver or design change that is approved by the ISS Payload Office.

2.1 APPLICABLE DOCUMENTS

2.1.1 CITED APPLICABLE DOCUMENTS

DOCUMENT NO.	TITLE
220G07455 Rev. D, July 26, 1996	Upper Structure Assembly Drawing
220G07475 Rev. C, April 22, 1996	SSPF Base Assembly Drawing
220G07500 Rev. A, July 10, 1995	Shipping Container, Integrated Assembly Drawing
683-50243 Rev. H, Mar. 30, 2000	Rack Equipment, U.S. Standard-Assy
MIL–STD–1553 Rev. B, Jan. 31, 1993	Digital Time Division Command/Response Multiplex Data Bus
NSTS 21000-IDD-MDK Rev. B, Aug. 15, 1996 IRN17, Aug. 5, 1997 IRN 18, Nov. 13, 1997 IRN 19, Jan. 1, 2000 IRN 20, Jan. 1, 2000 IRN 21, Jan. 1, 2000	Middeck Payloads Interface Definition Document for Middeck Accommodations
SSP 30482 (V1) Rev. B, Jan. 2, 1996	Electric Power Specifications and Standards, Vol. 1: EPS Performance Specifications
SSP 30573 Rev. B, Mar. 1, 1998	SSP Fluid Procurement and Use Control Specification
SSP 41017, Part 1 Rev. F, May 18, 2001	Rack to Mini Pressurized Logistics Module Interface Control Document (ICD), Part 1
SSP 41017, Part 2 Rev. H, May 18, 2001	Rack to Mini Pressurized Logistics Module Interface Control Document (ICD), Part 2

DOCUMENT NO.	TITLE
SSP 50251, Part 1 October 12, 2000	ARIS to Pressurized Element Interface Control Document, Part 1
SSP 50251, Part 2 October 12, 2000	ARIS to Pressurized Element Interface Control Document, Part 2
SSP 50835 April, 2008	ISS Pressurized Volume Hardware Common Interface Requirements Document
SSP 57000 Rev. E, Nov. 1, 2000 IRN 57000-0001, IRN 57000-0002 IRN 57000-0003 IRN 57000-0004 IRN 57000-0005	Pressurized Payload Interface Requirements Document
SSP 57001 Rev. C, Nov. 1, 2000 IRN 57001-0001	Pressurized Payload Hardware Interface Control Document Template
SSP 57005 Rev. B, March 11, 2002	Active Rack Isolation System to Pressurized Payload Interface Control Document
SSP 57008 Rev. B, October, 2009	Unique Pressurized Payload Non-Rack Interface Control Document Template
SSQ 21635 Rev. J, Jan. 15, 2000	Connectors and Accessories, Electrical, Circular, Miniature, IVA/EVA Compatible, Space Quality, General Specification for
SSQ 22678 Rev. E, June 16, 1998	Space Station Program Office Microcircuit Hybrid, MIL-STD-1553, Terminal Interface and Transceiver Space Quality Specification

2.1.2 IRD REFERENCED DOCUMENTS

DOCUMENT NO.	TITLE
220G07470 Rev. B, Mar. 30, 1995	MSFC Base Assembly Drawing
683-10007 Rev. L, Mar. 21, 1997 ADCN H12, H13, H14, H15, H16, H17	Fire Detection Assembly
683–16348 Rev. G, Jan. 1, 1998	Coupling, Quick Disconnects, Fluid, Self–sealing, Internal Envelope Drawing
683-17103 Rev. A, Oct. 20, 1994	Fluid System Servicer (FSS) Interface Definition Drawings

DOCUMENT NO.	TITLE
CCSDS 701.0-B-2 Issue 2, Nov. 1992	Advanced Orbiting Systems, Network and Data Links: Architectural Specification, Blue Book
D684-10056-01 Rev. H, Oct. 5, 1998 DCN 004, 002, 003, 005-103	International Space Station Program, Prime Contractor Software Standards and Procedures Specification
EIA-RS-170 Rev. A, Nov. 1997	Electrical Performance Standards for Television Studio Facilities
EIA/TIA 250 Rev. E, July 1991	Electrical Performance for Television Relay Facility
FED-STD-595 Rev. B, Dec. 15, 1989	Colors Used in Government Procurement
ICD-A-21378	SSP DEAP to ISSP HAS/CHEK GSE Interfaces
ICD-A-21379	ISS Payload/GSE Ground Operations Envelope ICD
IEEE 802.3	Institute of Electrical and Electronic Engineers 802.3 (Ethernet) Standard
ISO/IEC 8802-3 4th Edition, July 1993	Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
JSC 27199 Rev. A, Mar. 1997	End Item Specification for the International Space Station Portable Utility Light
JSC 27260 Rev. B, Sept. 1997	Decal Process Document and Catalog
MA2-95-048 Sept. 26, 1995	Thermal Limits for Intravehicular Activity
MIL-STD-1686 Rev. B, Dec. 31, 1992	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) Document
MSFC-SPEC-250 Rev. A, Oct. 1, 1977	Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for Document
MSFC-STD-275 Nov. 1, 1963	Marking of Electrical Ground Support Equipment, Front Panels and Rack Title Plates
MSFC-STD-531 Sept. 1978	High Voltage Design Criteria
NASA TM 102179 June 1, 1991	Selection of Wires and Circuit Protective Devices for STS Orbiter Vehicle Payload Electrical Circuits

DOCUMENT NO.	TITLE
NSTS 1700.7B Jan. 13, 1989 CN 1, Feb. 24, 1998 CN 2, Jan. 20, 1994 CN 3, Dec. 8, 1995 CN 4, Mar. 21, 1997 CN 5, Oct. 12, 1998 CN 6, Jul. 28, 1999 CN 7, Jul. 29, 2000 CN 8, Aug. 22, 2000 CN 9, Jan. 29, 2001 CN 10, Mar. 12, 2001 CN 11, May 11, 2001	Safety Policy and Requirements for Payloads Using the Space Transportation System
NSTS 18798 Rev. B, Sep., 1999 CN 7, Oct., 2000	Interpretations of NSTS/ISS Payload Safety Requirements
NTC Report No. 7 Jan. 1976	Video Facility Testing Technical Performance Objectives (NTC)
SN-C-0005 Rev. C, Feb. 15, 1989	NSTS Contamination Control Requirements Manual
SSP 30233 Rev. E, Nov. 21, 1995	Space Station Requirements for Material and Processes
SSP 30237 Rev. C, June 6, 1996	Space Station Requirements for Electromagnetic Emission and Susceptibility Requirements
SSP 30240 Rev. C, June 15, 1999 DCN 002	Space Station Grounding Requirements
SSP 30242 Rev. E, Aug. 25, 1999	Space Station Cable/Wire Design and Control Requirements for Electromagnetic Compatibility
SSP 30243 Rev. E, July 29, 1998 DCN 003, 004, 005	Space Station Requirements for Electromagnetic Compatibility
SSP 30245 Rev. E, Nov. 23, 1999	Space Station Electrical Bonding Requirements
SSP 30257:004 Rev. E, Nov. 22, 1996	Space Station Program Intravehicular Activity Restraints and Mobility Aids Standard ICD
SSP 30262:013 Rev. G, April 1, 1998	Smoke Detector Assembly Standard ICD

DOCUMENT NO.	TITLE
SSP 30426 Rev. D, May 13, 1994 DCN 001	External Contamination Control Requirements
SSP 30512 Rev. C, Jun. 3, 1994	Ionizing Radiation Design Environment
SSP 41002 Rev. I, Mar. 31, 1999	International Standard Payload Rack to NASA/NASDA Modules Interface Control Document
SSP 50005 Rev. B, Nov. 21, 1995	International Space Station Flight Crew Integration Standard (NASA-STD-3000/T) Document
SSP 50053 Rev. A., Jan. 1999	ASI Flight Hardware to Launch and Landing Site Interface Control Document
SSP 50184 Rev. A, Aug. 15, 1997	High Rate Data Link Physical Media, Physical Signaling & Protocol Specifications
SSP 50313 Rev B, Jan. 24, 2004	Display and Graphical Commonality Standard
SSP 52005 Rev. B, Dec. 10, 1998	ISS Payload Flight Equipment and Guidelines For Safety Critical Structures
SSP 52050 Rev. A, Sept. 25, 1998	Software Interface Control Document, Part 1, International Standard Payload Rack to International Space Station
SSP 57002 Rev. B, Aug. 7, 2002	Pressurized Payload Software ICD Template
SSQ 21654 Rev. C, Sept. 8, 1998	Cable, Single Fiber, Multitude, Space Quality, General Specification for Document
SSQ 21655 Rev. E, July 15, 1998	Cable, Electrical, MIL-STD-1553 DataBus, Space Quality, General

3.0 PAYLOAD INTERFACE

3.1 STRUCTURAL/MECHANICAL

3.1.1 RACK ATTACHMENT INTERFACES

3.1.1.1 GSE INTERFACES

A. The KSC Rack Insertion Device (RID) attaches to the GSE interfaces on the front of the FIR as defined in SSP 41017 Part 2, paragraph 3.3.3, Ground Handling Attachment Interfaces, and will accommodate only the payload protrusions identified in SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope. It also pivots the FIR to install it into the MPLM. The pivot keepout envelope is also identified in SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope. RID Ground handling loads for GSE points E, F, G, H are identified in SSP 41017 Part 1, paragraph 3.2.1.4.3 Interface Loads, and are much less than the launch and landing loads for points A, B, C, and D. The NASA 683-50243-4 ISPR and the JAXA ISPR meet the interfaces defined above.

FIR protrusions which affect ground processing are illustrated in Figure 3.1.1.1-1, FIR Ground Operations Rack Protrusions. The FIR is ARIS equipped and will utilize a removable umbilical design. The FIR umbilicals will launch in a stowage location and be attached on orbit. The FIR will utilize the 683-50243-4 ISPR.

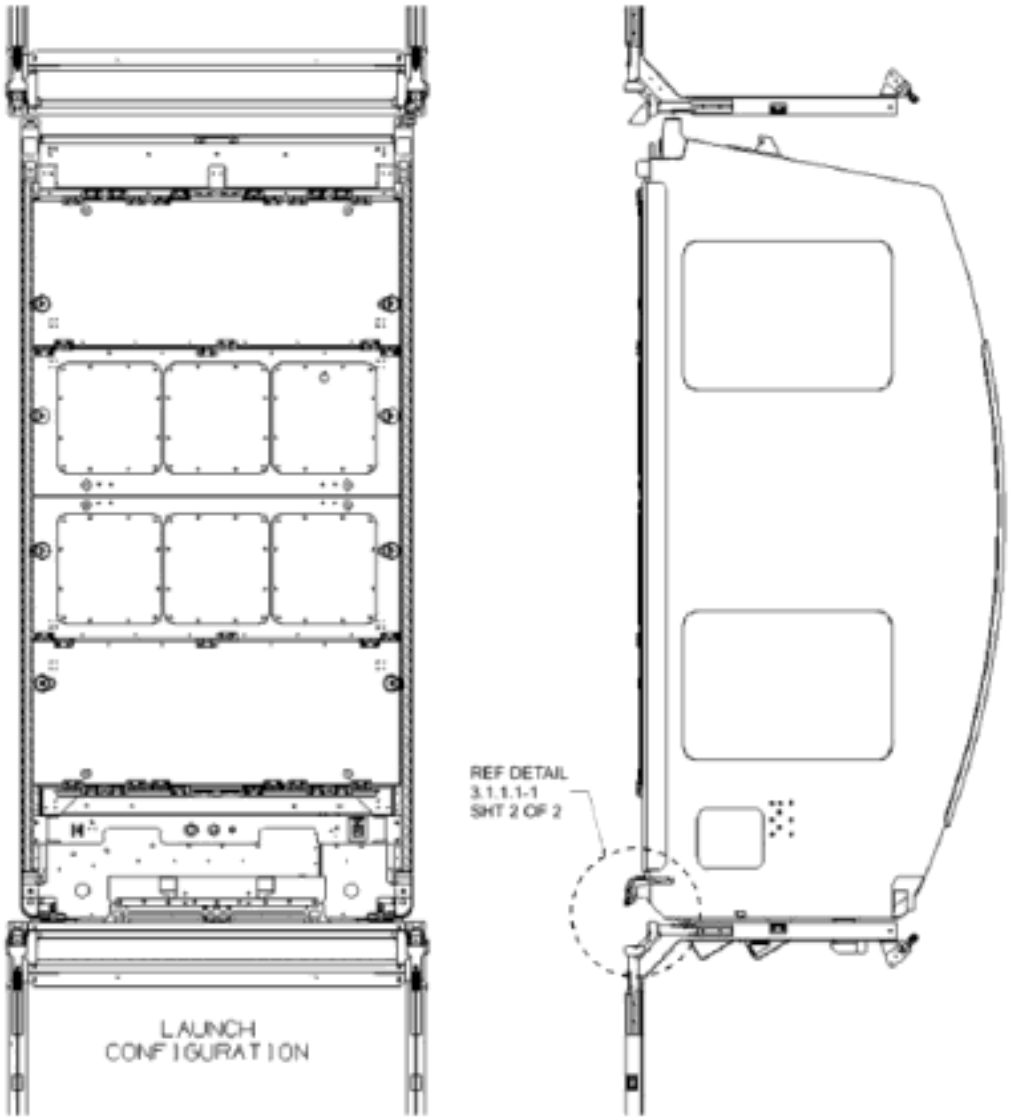


FIGURE 3.1.1.1-1 FIR GROUND OPERATIONS RACK PROTRUSIONS (SHEET 1 OF 2)

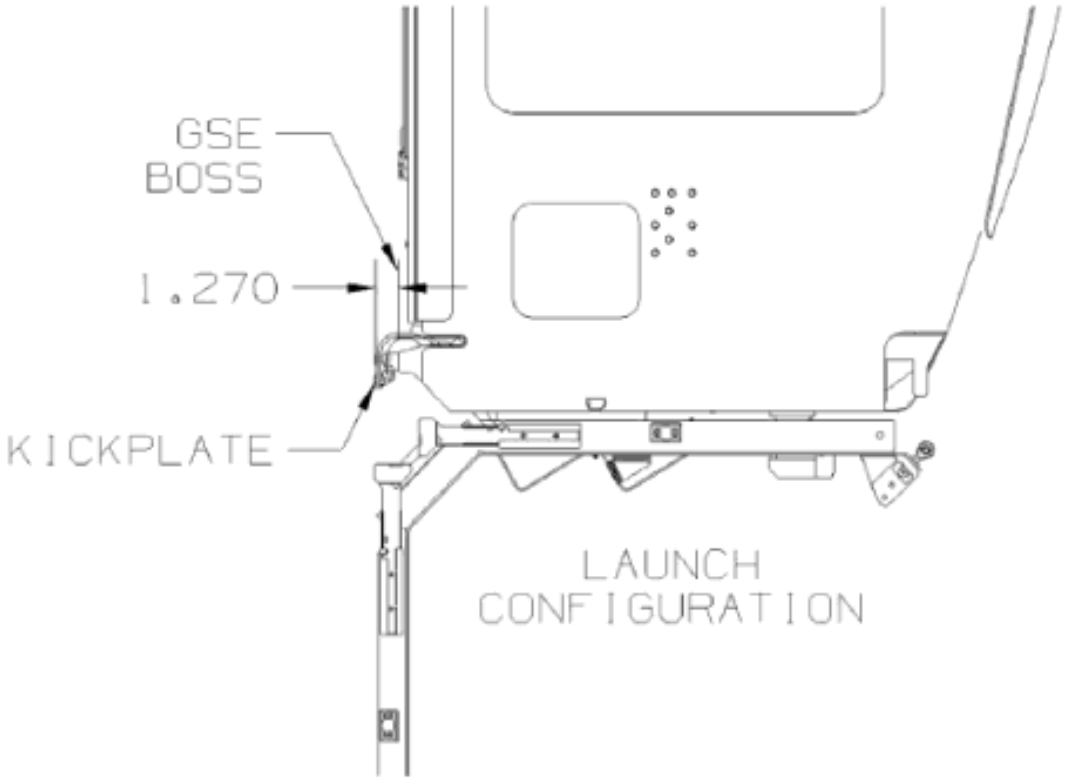


FIGURE 3.1.1.1-1 FIR GROUND OPERATIONS RACK PROTRUSIONS (SHEET 2 OF 2)

B. All integrated racks may be shipped in an ISS-provided Rack Shipping Container (RSC). The FIR interfaces to the RSC per Teledyne Brown Engineering (TBE) drawing 220G07500, Shipping Container Integrated Assembly Drawing. The RSC accommodates the static envelope of the ISPR identified in SSP 41017 Part 1, paragraph 3.2.1.1.2, Static Envelope.

The FIR will utilize an ISS-provided RSC for shipping and will stay within the ISPR static envelope for shipment.

C. All NASA ISPRs are integrated in a Rack Handling Adapter (RHA). JAXA Racks may be integrated in a JAXA Rack Stand. The FIR interfaces with the RHA per TBE drawings 220G07455, Upper Structure Assembly Drawing; and 220G07475, SSPF Base Assembly Drawing. The RHA accommodates the static envelope of the ISPR identified in SSP 41017 Part 1, paragraph 3.2.1.1.2, Static Envelope.

The FIR will be integrated in an ISS-provided RHA for rack handling and integration.

3.1.1.2 MPLM INTERFACES

A. MPLM interfaces for rack attach points A, B, (lower rear attach points) C, D (upper kneebrace attach points) and pivot points I, J are identified in SSP 41017 Part 2, Figure 3.1.1-1. Any MPLM location restrictions are identified in Figure 3.1.1.2-1, MPLM Rack Restrictions.

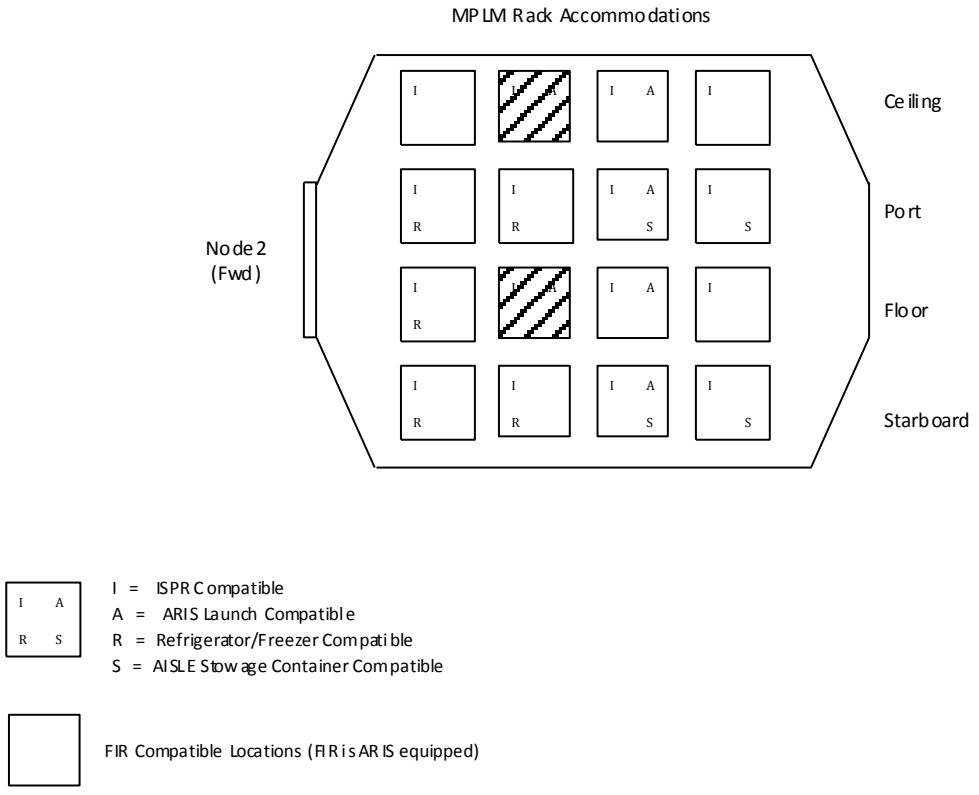


FIGURE 3.1.1.2-1 MPLM RACK RESTRICTIONS

B. The FIR launch mass and Center of Gravity (CG) are defined in Table 3.1.1.2-1, FIR Mass and Center of Gravity (CG).

The FIR has a modal frequency of 29.8 Hz.

TABLE 3.1.1.2-1 FIR MASS AND CENTER OF GRAVITY (CG)

PHASE	MASS (lbs)	CG (in)1
Integration (Rack)	1683.92	x: 18.2 y: -10.5 z: 36.7
Launch (Rack)	1377.2	x: 19.0 y: -9.3 z: 36.3
On-Orbit	1683.92	x: 18.2 y: -10.5 z: 36.7
Landing	1377.2	x: 19.0 y: -9.3 z: 36.7

Notes: 1. The CG reference point is the Rack Datum Point defined in Figure 3.1.3-1, Rack Coordinate System, of SSP 41017 Part 2.
2. These are estimated maximum values based on the worst case PHASE-2 experiment as of March 31, 2002.

3.1.1.3 ISS INTERFACES

A. The FIR interfaces to the ISS at attachment point locations C, D, I and J as defined in SSP 41017 Part 1, Paragraph 3.2.1.1.1 and SSP 41047 Part 2, Paragraph 3.1.1. The NASA and JAXA ISPRs meet these interfaces. FIR / ARIS interfaces to the USL are identified in SSP 50251, Parts 1 and 2. ARIS to FIR interfaces are identified in SSP 57005.

The FIR has been granted program approval to design for accommodation in the USL only.

B. FIR temporary on-orbit protrusions are identified in Figure 3.1.1.3-1*, Rack Door/Optics Bench Protrusion Envelope. The FIR can be rotated a minimum of 80 degrees from the LAB1S3 rack location**. The FIR does not have protrusions which extend beyond the GSE plane that affect rack rotation**.

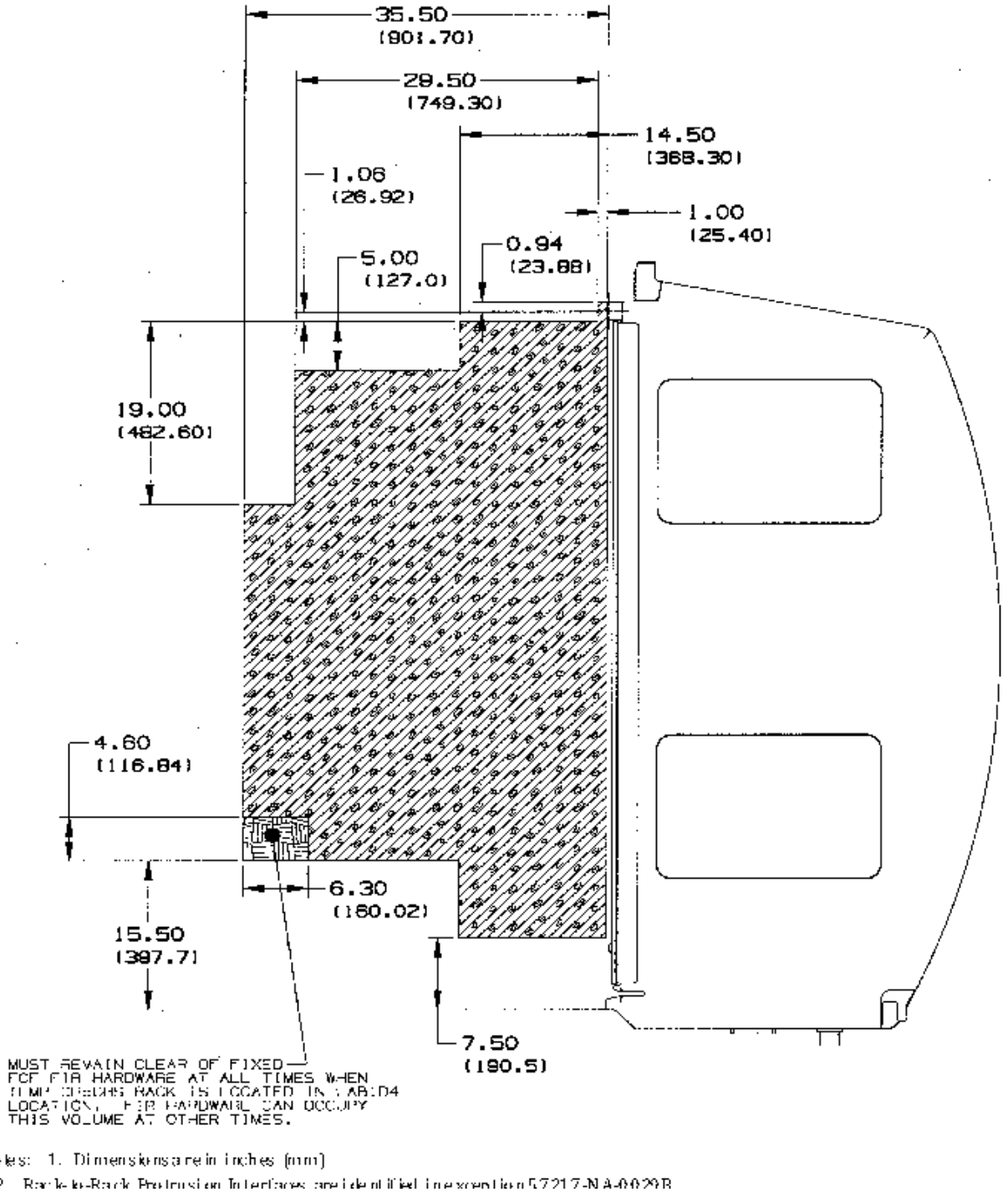
*This condition represents an exception to requirements found in SSP 57000, paragraph 3.1.1.7.3.A. Refer to 57218-NA-0001. Table 5.1-1 provides the status of all exceptions.

**This condition represents an exception to requirements found in SSP 57000, paragraph 3.1.1.4.E. Refer to SSP 57217-NA-0039. Table 5.1-1 provides the status of all exceptions.

C. The FIR Portable Fire Extinguisher (PFE) access port, Rack Maintenance Switch (rack power switch), Smoke Indicator Light Emitting Diode (LED), and all Caution and Warning labels must be clearly visible and unobstructed. A keep-out zone must be maintained for insertion of the PFE bottle. Figure 3.1.1.3-2, PFE Access Port, Rack

Maintenance Switch and Smoke Indicator LED, identifies the location of the PFE access port, Rack Maintenance Switch, Smoke Indicator LED, and all Caution and Warning labels.

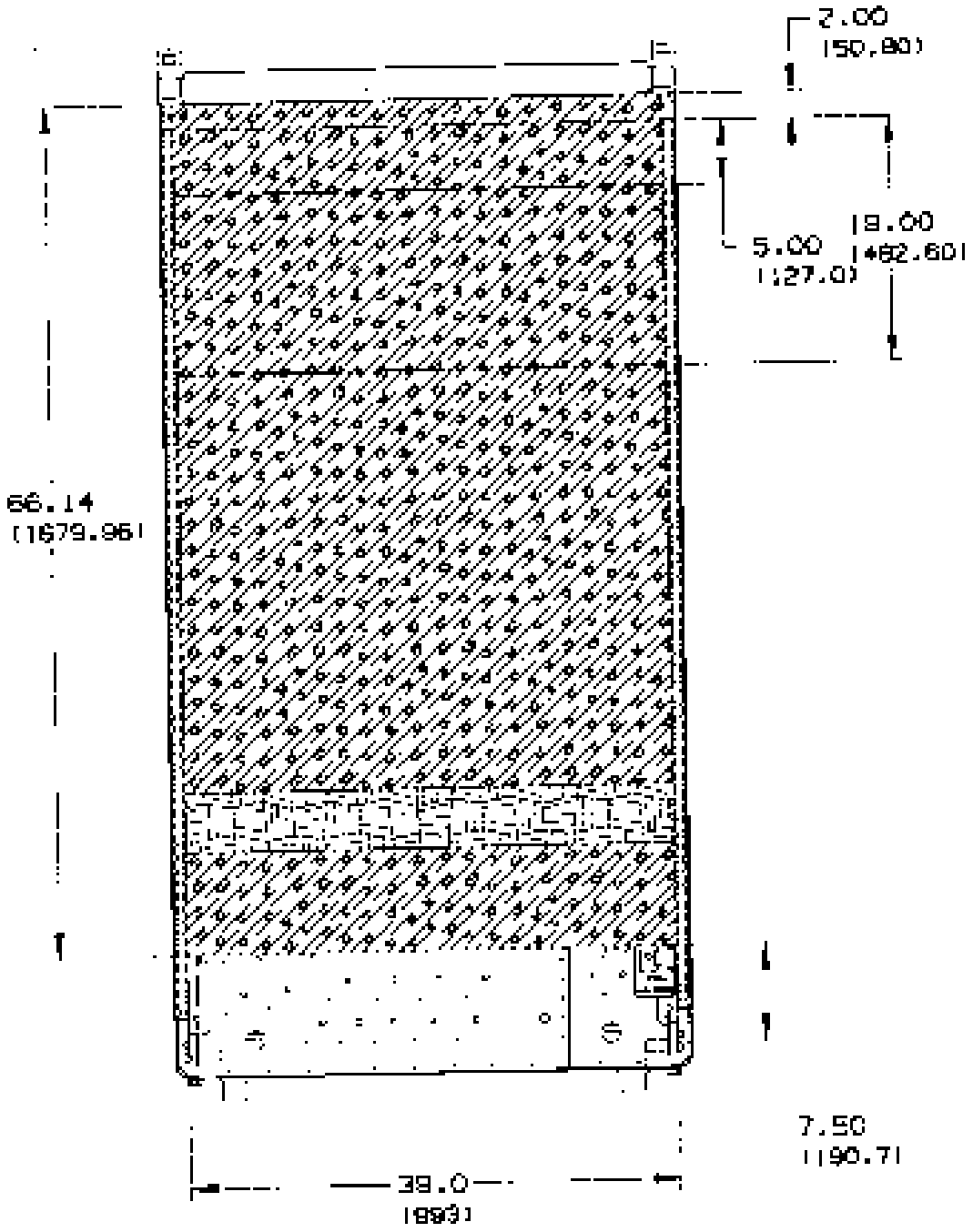
D. The FIR on-orbit mass and CG are defined in Table 3.1.1.2-1.



Notes: 1. Dimensions are in inches (mm)
2. Rack-to-Rack Protrusion Interfaces are identified in exception 57217-NA-0029B

FIGURE 3.1.1.3-1 RACK DOOR/OPTICS BENCH PROTRUSION ENVELOPE

(SHEET 1 OF 2)



Notes: 1. Dimensions are in inches (mm)
2. Rack-to-Rack Protrusion Interfaces are identified in exception 57217-NA-0029B.

FIGURE 3.1.1.3-1 RACK DOOR/OPTICS BENCH PROTRUSION ENVELOPE (SHEET 2 OF 2)

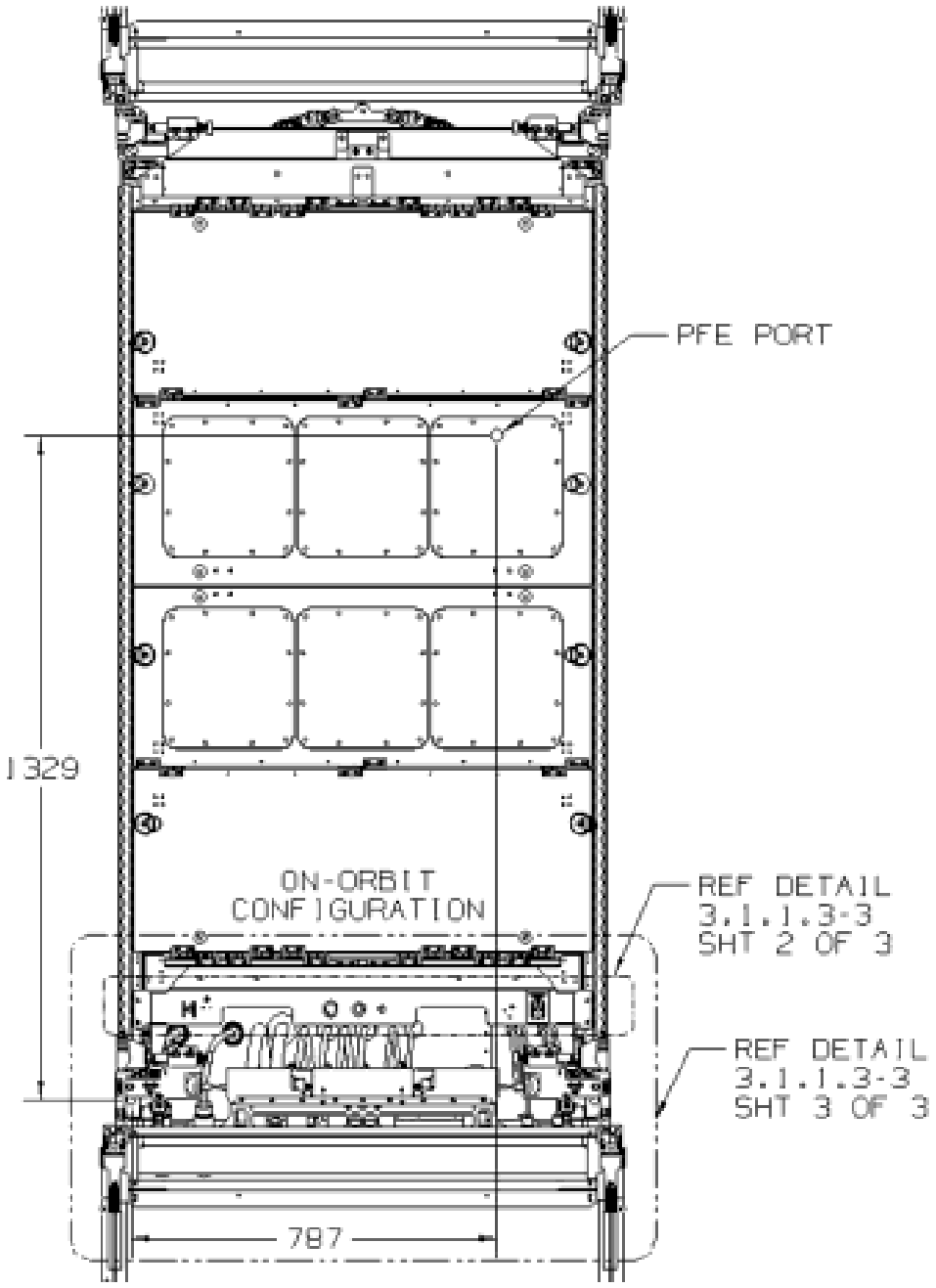


FIGURE 3.1.1.3-2 PFE ACCESS PORT, RACK MAINTENANCE SWITCH AND SMOKE INDICATOR LED (SHEET 1 OF 3)

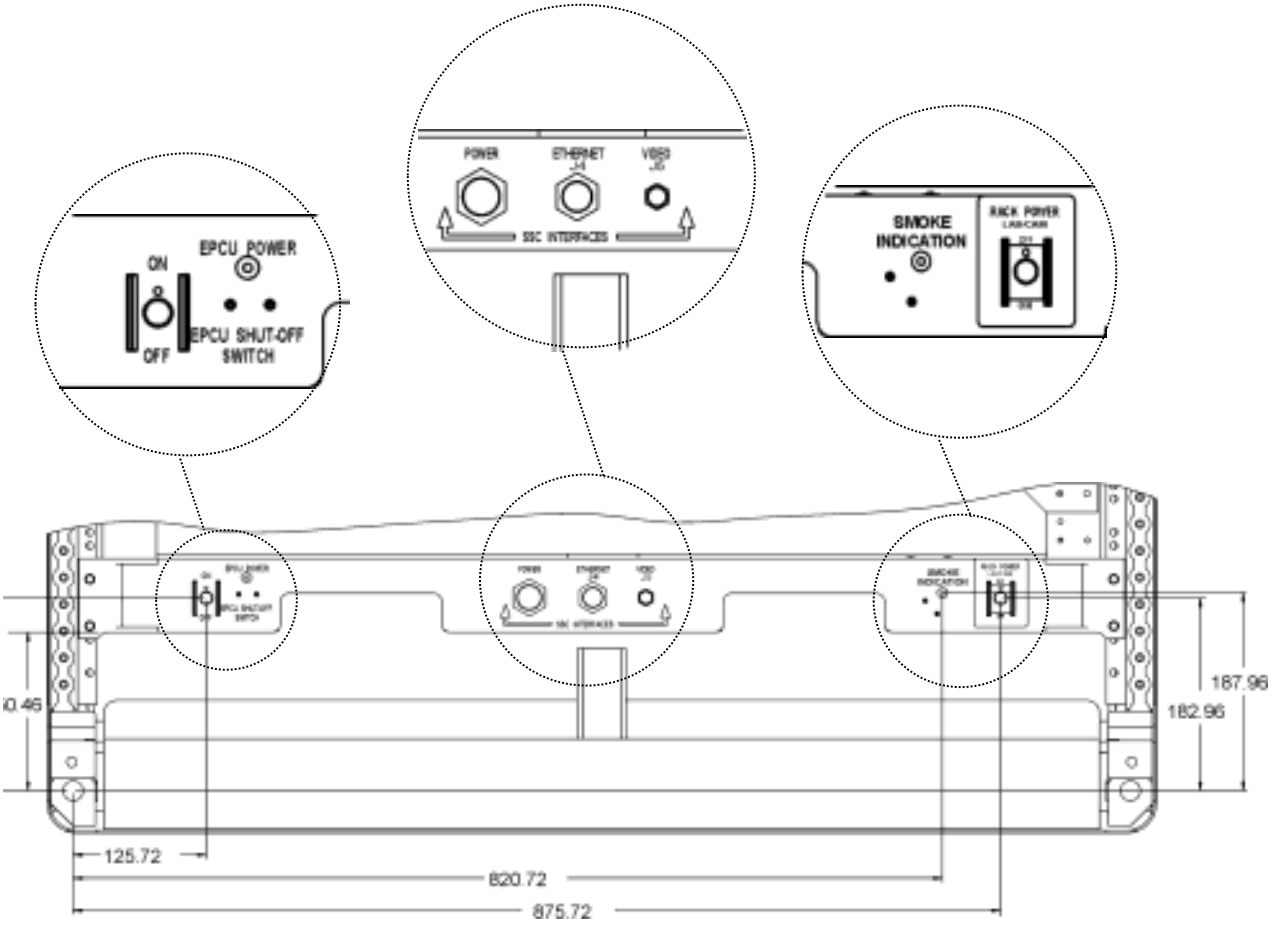


FIGURE 3.1.1.3-2 PFE ACCESS PORT, RACK MAINTENANCE SWITCH AND SMOKE INDICATOR LED (SHEET 2 OF 3)

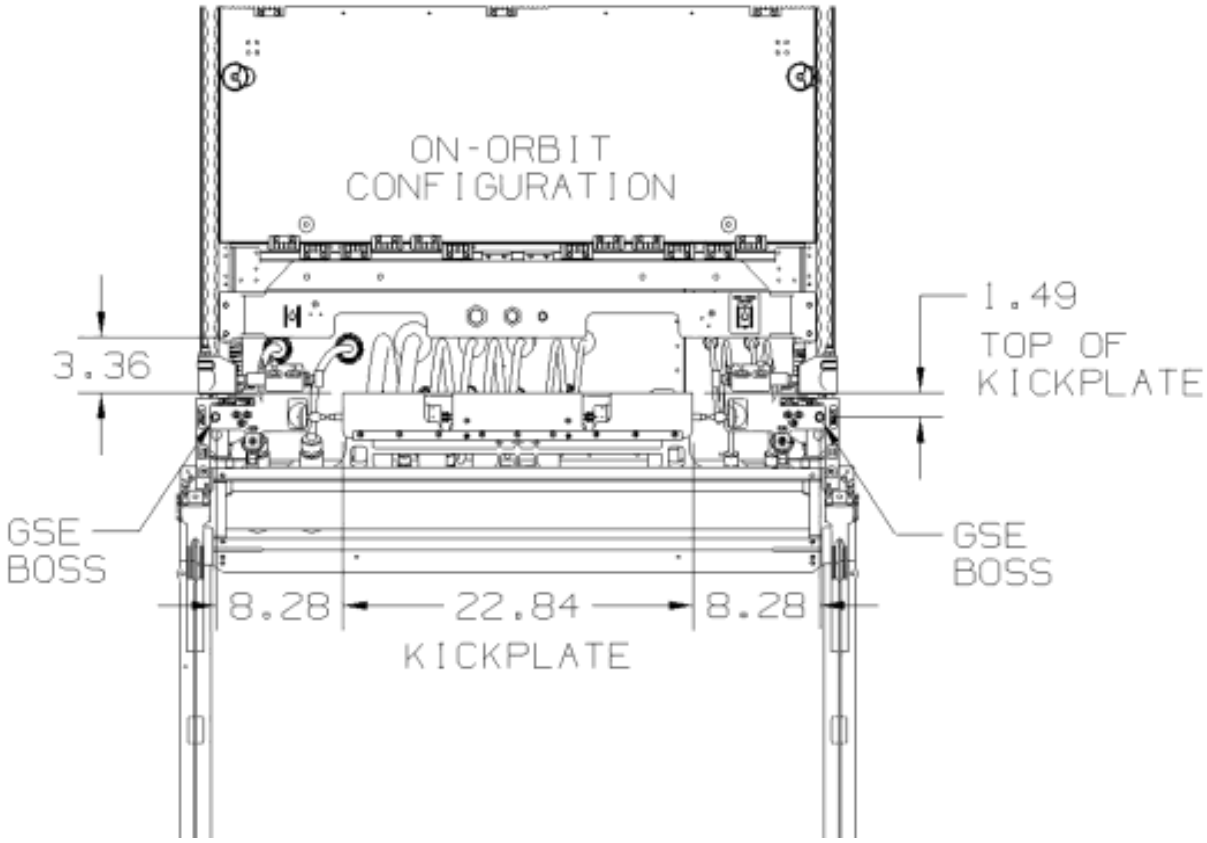


FIGURE 3.1.1.3-2 PFE ACCESS PORT, RACK MAINTENANCE SWITCH AND SMOKE INDICATOR LED (SHEET 3 OF 3)

3.1.1.3.1 RACK TO RACK UMBILICAL DESIGN

CIR and FIR will have the ability to communicate with each other and therefore extend the capability of each rack. The racks will have a fiber optic communications link between them. The fiber optic cables violate SSP 57000 Paragraph 3.1.1.7 On-orbit Payload Protrusions. The details of the rack to rack umbilical design can be found in exception 57217-NA-0029B.

3.1.2 CONNECTOR INTERFACES

The physical interface of the FIR to ISS system services is at the USL Utility Interface Panel (UIP). The UIP location is shown in Figure 3.1.2-1, UIP Location and Dimensions. The ISS system services connector layout at the UIP is shown in Figure 3.1.2-2, USL Specific Connector Locations. The ISS system services connectors are defined in Table 3.1.2-1, ISS System Services Connector Part Numbers.

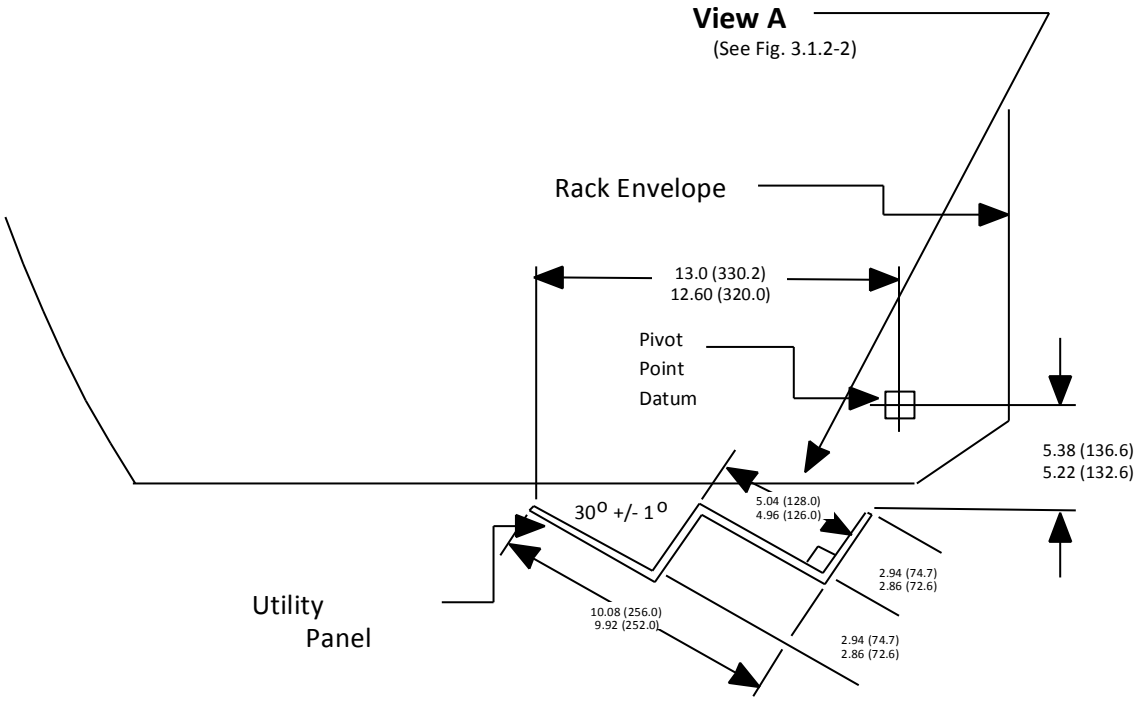
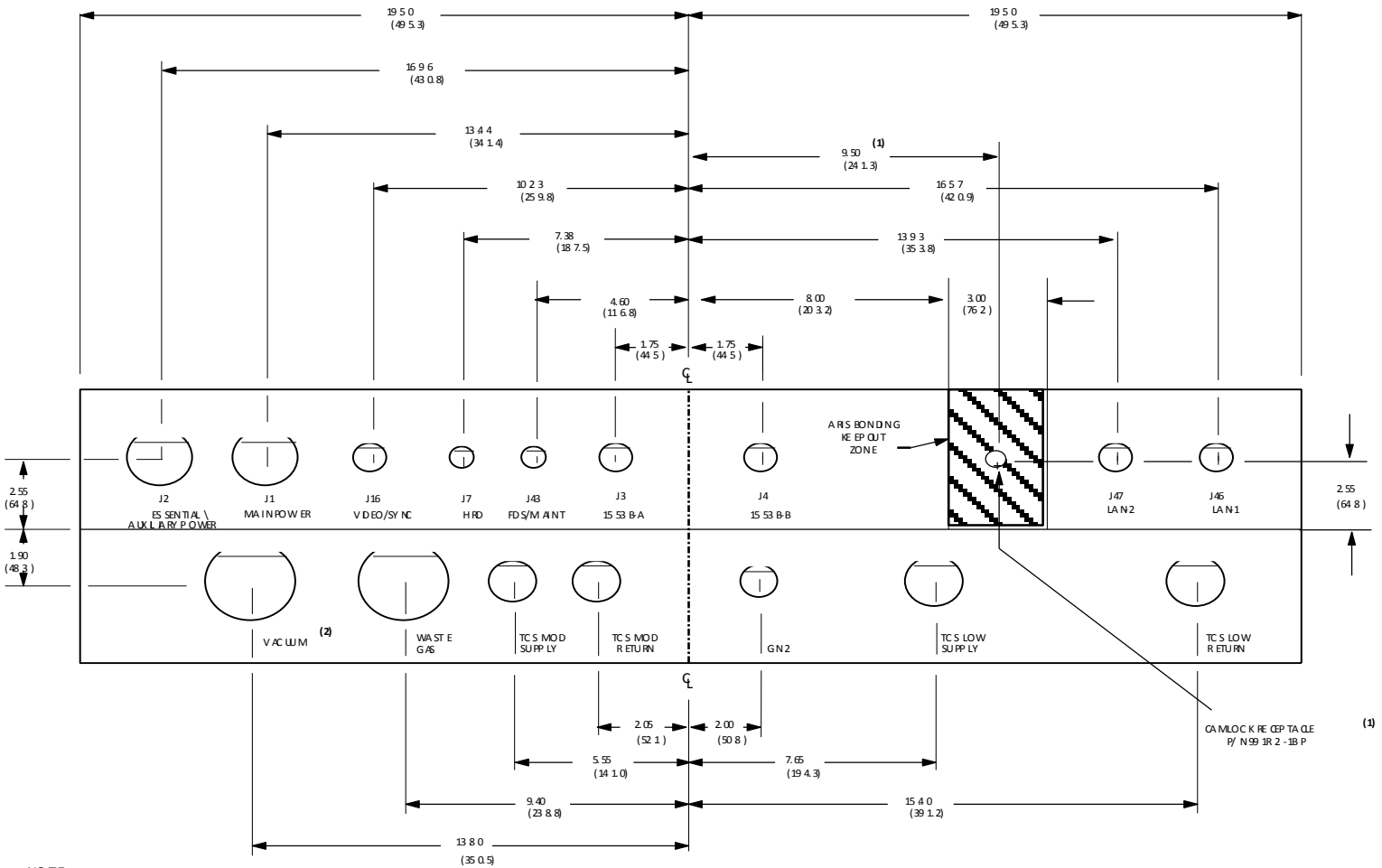


FIGURE 3.1.2-1 UIP LOCATION AND DIMENSIONS



NOTE

1) Cambck Receptade to be installedat location shown.
2) Not avalableon USL Racks LAB1P1, LAB1P2, LAB1P4, LAB1D3.
3) All dimensions are nominal dimensions.

FIGURE 3.1.2-2 USL SPECIFIC CONNECTOR LOCATIONS

TABLE 3.1.2-1 ISS SYSTEM SERVICES CONNECTOR PART NUMBERS

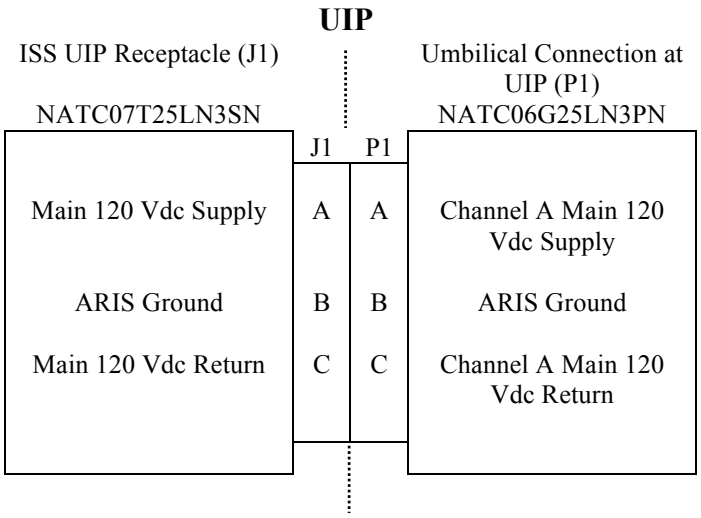
ISS Resource	ISS Connector Designation	ISS UIP Receptacle Part Number		ARIS UIP Mating Connector Part Number
UIP				
Main Power	J1	NATC07T25LN3SN	P1	NATC06G25LN3PN
Essential/Auxiliary Power	J2	NATC07T25LN3SA	P2	NATC06G25LN3PA
MIL-STD-1553B Bus A	J3	NATC07T15N35SN	P3	NATC06G15N35PN
MIL-STD-1553B Bus B	J4	NATC07T15N35SA	P4	NATC06G15N35PA
HRDL	J7	NATC07T13N4SN	P7	NATC06G13N4PN
Optical Video	J16	NATC07T15N97SB	P16	NATC06G15N97PB
FDS/Power Maintenance	J43	NATC07T13N35SA	P43	NATC06G13N35PA
EWACS	J45	NATC07T11N35SC		N/A
LAN-1	J46	NATC07T11N35SA	P46	NATC06G11N35PA
LAN-2	J47	NATC07T11N35SB	P47	NATC06G11N35PB
Electrical video	J77	NATC07T13N35SB		N/A
TCS Moderate Temp Loop Supply	TCS MOD SUPPLY	683-16348, Male Category 6, Keying B		683-16348, Female, Category 6, Keying B
TCS Moderate Temp Loop Return	TCS MOD RETURN	683-16348, Male, Category 6, Keying C		683-16348, Female, Category 6, Keying C
TCS Low Temp Loop Supply	TCS LOW SUPPLY	683-16348, Male, Category 6, Keying B		N/A
TCS Low Temp Loop Return	TCS LOW RETURN	683-16348, Male, Category 6, Keying C		N/A
Waste Gas System	WASTE GAS	683-16348, Male, Category 3, Keying B		683-16348, Female, Category 3, Keying B
Vacuum Resource System	VACUUM	683-16348, Male, Category 3, Keying A		683-16348, Female, Category 3, Keying A
Gaseous Nitrogen	GN_2	683-16348, Male, Category 8, Keying B		683-16348, Female, Category 8, Keying B
Argon	Ar	683-16348, Male, Category 8, Keying C		N/A
Helium	He	683-16348, Male, Category 8, Keying E		N/A
Carbon Dioxide	CO_2	683-16348, Male, Category 8, Keying D		N/A
Fluid Services				
Potable Water	Potable Water	683-16348, Male, Category 7, Keying D		N/A
Fluid System Servicer	Fluid System Services	683-16348, Male, 0.50 inch QD, universal (no keying)		683-16348, Female, 0.50 inch QD, universal (no keying)

3.2 ELECTRICAL POWER INTERFACES

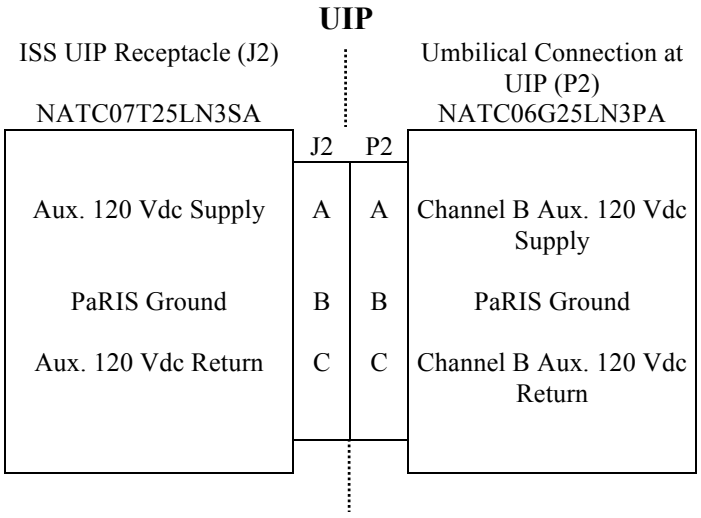
3.2.1 CONNECTORS

3.2.1.1 UTILITY INTERFACE PANEL

The FIR electrical power connectors, J1 and J2, interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The J1 and J2 part numbers are defined in Table 3.1.2-1 and the pin assignments are defined in Figure 3.2.1.1-1, UIP Electrical Power Connectors and Pin Assignments.



P1 Power Interface (3 kW or 6 kW)



P2 Power Interface (1.2 kW to 1.44 kW) or (6 kW in 12 kW location)

FIGURE 3.2.1.1-1 UTILITY INTERFACE PANEL ELECTRICAL POWER CONNECTORS AND PIN ASSIGNMENTS

3.2.1.2 UTILITY OUTLET PANEL

The FIR will not require an interface to the Utility Outlet Panel (UOP).

3.2.2 ELECTROMAGNETIC COMPATIBILITY

3.2.2.1 BONDING

Standard bonding interfaces will be removed for FIR operations. See paragraph 3.2.2.2 for ARIS unique bonding interfaces.

3.2.2.2 ARIS ISPR BONDING

Bonding for ARIS ISPRs is accomplished through the use of a mesh strap that is provided as part of the ARIS standard umbilical assembly which is part of the ARIS Kit. ARIS ISPRs are bonded to the ISS through an interface on the UIP on the module standoff.

The location of the bonding interface and receptacle on module structure is defined in Figure 3.1.2-2. The receptacle part number is 991R2-1BP (built by Camlock AG) and will be supplied and installed by the module provider.

The ARIS provided bonding strap will include captive fasteners used for mating the bonding strap to the module provided receptacle as shown in Figure 3.2.2.2-1, ARIS/ISPR Bonding Interface Profile.

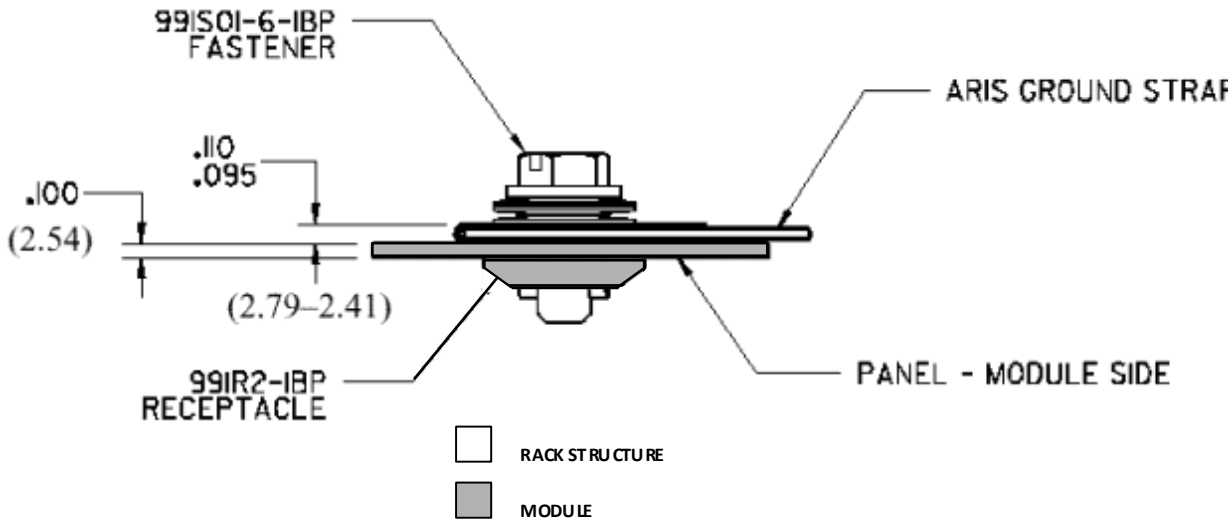


FIGURE 3.2.2.2-1 ARIS/ISPR BONDING INTERFACE PROFILE

3.2.3 POWER QUALITY

The FIR will receive power that complies with SSP 30482, Volume 1.

3.2.4 POWER HANDLING CAPABILITY

Specific characteristics of ISPR locations are shown in Table 3.2.4-1, ISPR Locations with Specific EPS Characteristics.

TABLE 3.2.4-1 ISPR LOCATIONS WITH SPECIFIC EPS CHARACTERISTICS

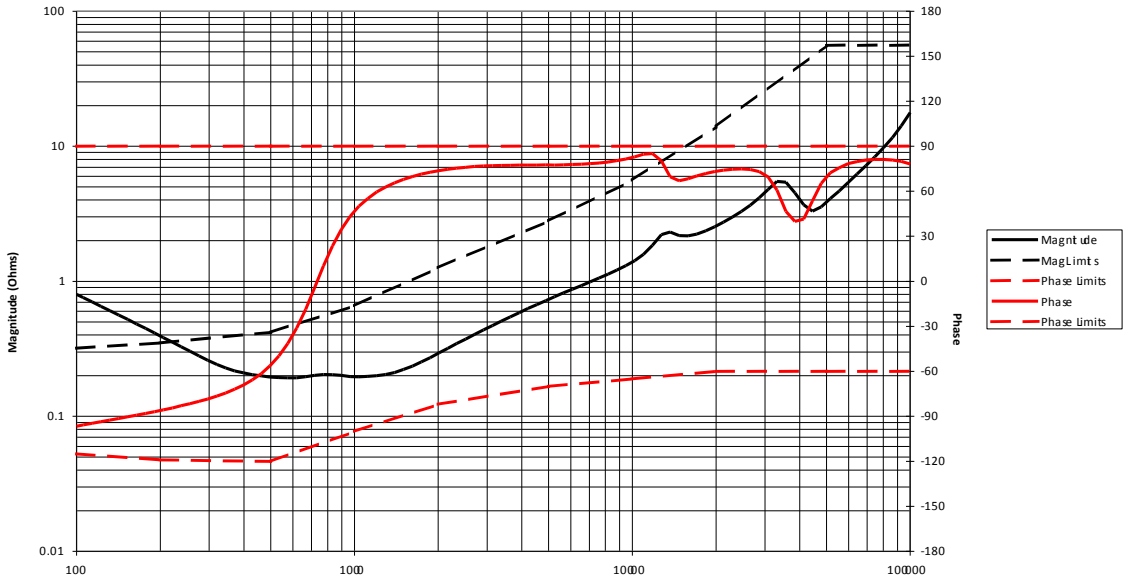
LOCATION	MAIN (kW)	MAIN RPC CURRENT RATING (Amps)	AUXILIARY RPC CURRENT RATING (Amps)	RPC TYPE main/aux.
USL				
LAB1O1	3	25	12	VI/V
LAB1O2	3	25	12	VI/V
LAB1O3	12	*2 - 50	*1 OF 2 - 50	III/III
LAB1O4	6	50	12	III/V
LAB1O5	3	25	12	VI/V
LAB1S1	3	25	12	VI/V
LAB1S2	6	50	12	III/V
LAB1S3	12	*2 - 50	*1 OF 2 - 50	III/III
LAB1S4	6	50	12	III/V
LAB1D3	3	25	12	VI/V
LAB1P1	6	50	12	III/V
LAB1P2	12	*2 - 50	*1 OF 2 - 50	III/III
LAB1P4	6	50	12	III/V

* 12 kW Locations receive power from two independent 6 kW power feeds. Each 6 kW feed contains a Type III RPC for upstream circuit protection.

3.2.5 IMPEDANCE LIMITS

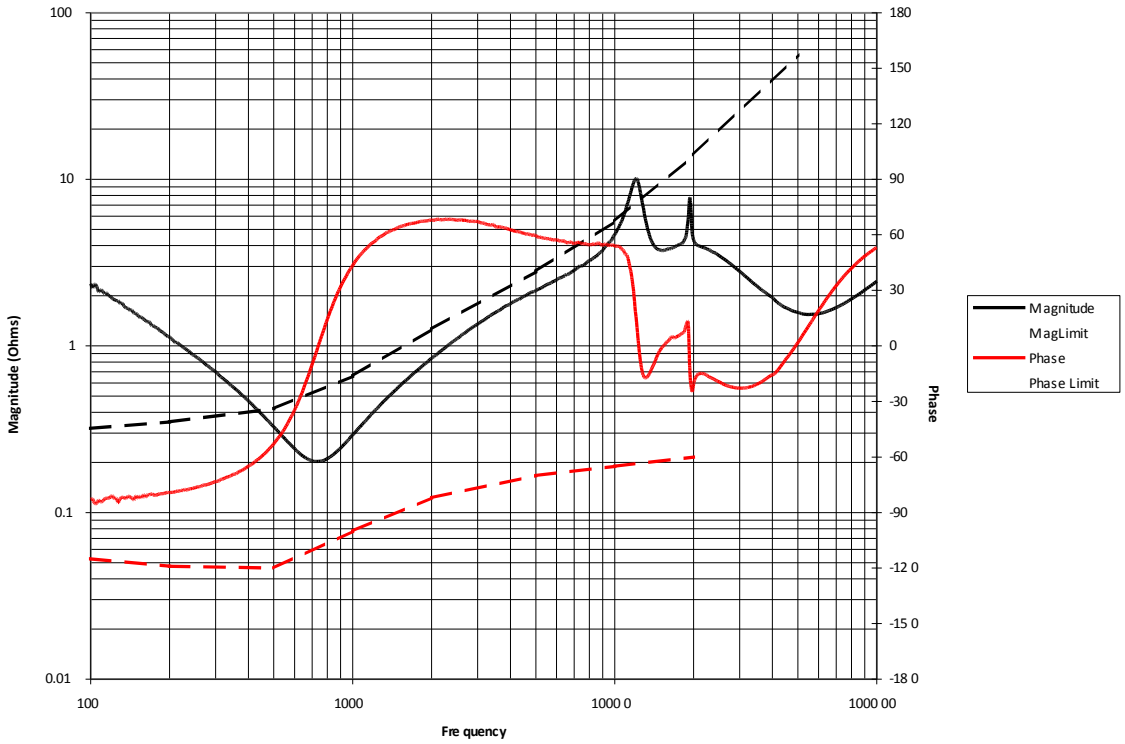
3.2.5.1 LOAD IMPEDANCE LIMITS

The FIR load impedance magnitude and phase limits at the UIP interface is defined in Figures 3.2.5.1-1, 3.2.5.1-2 and 3.2.5.1-3.



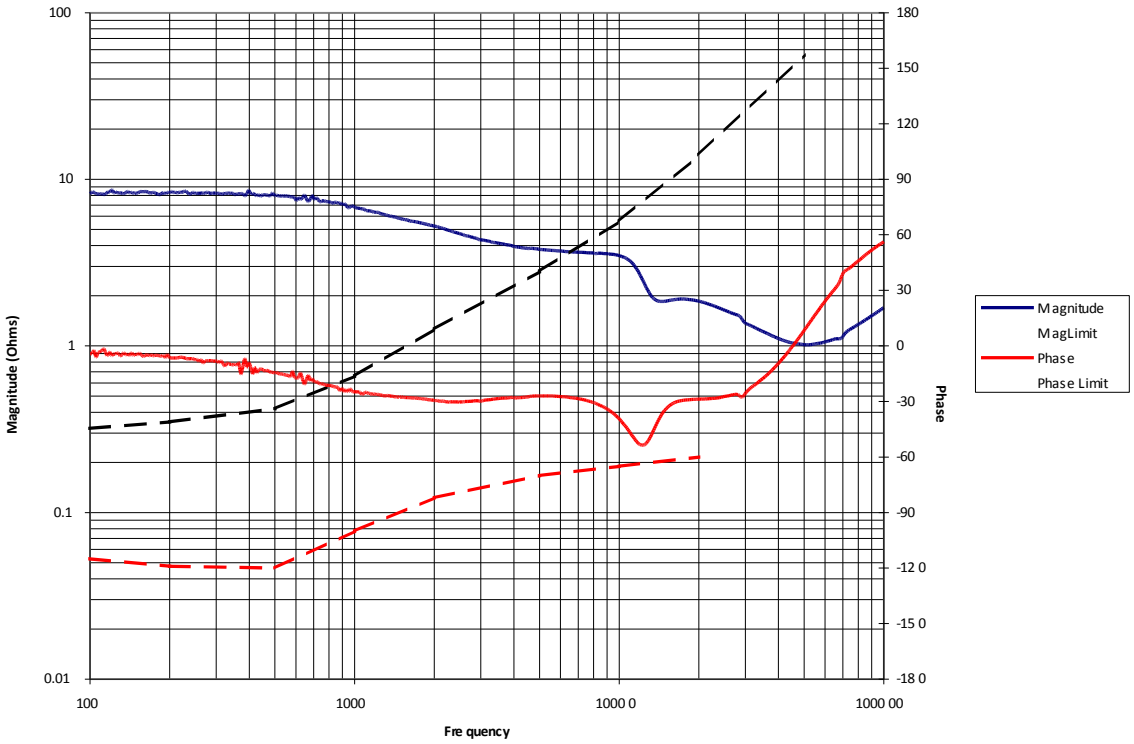
Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub−rack payload on the EPCU 28V outputs.

FIGURE 3.2.5.1-1 FIR INPUT IMPEDANCE WITH 3KW LOAD ON THREE PARALLEL 28V CONVERTERS



Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub−rack payload on the EPCU 28V outputs

FIGURE 3.2.5.1–2 FIR INPUT IMPEDANCE WITH 112W LOAD ON THREE PARALLEL 28V CONVERTERS

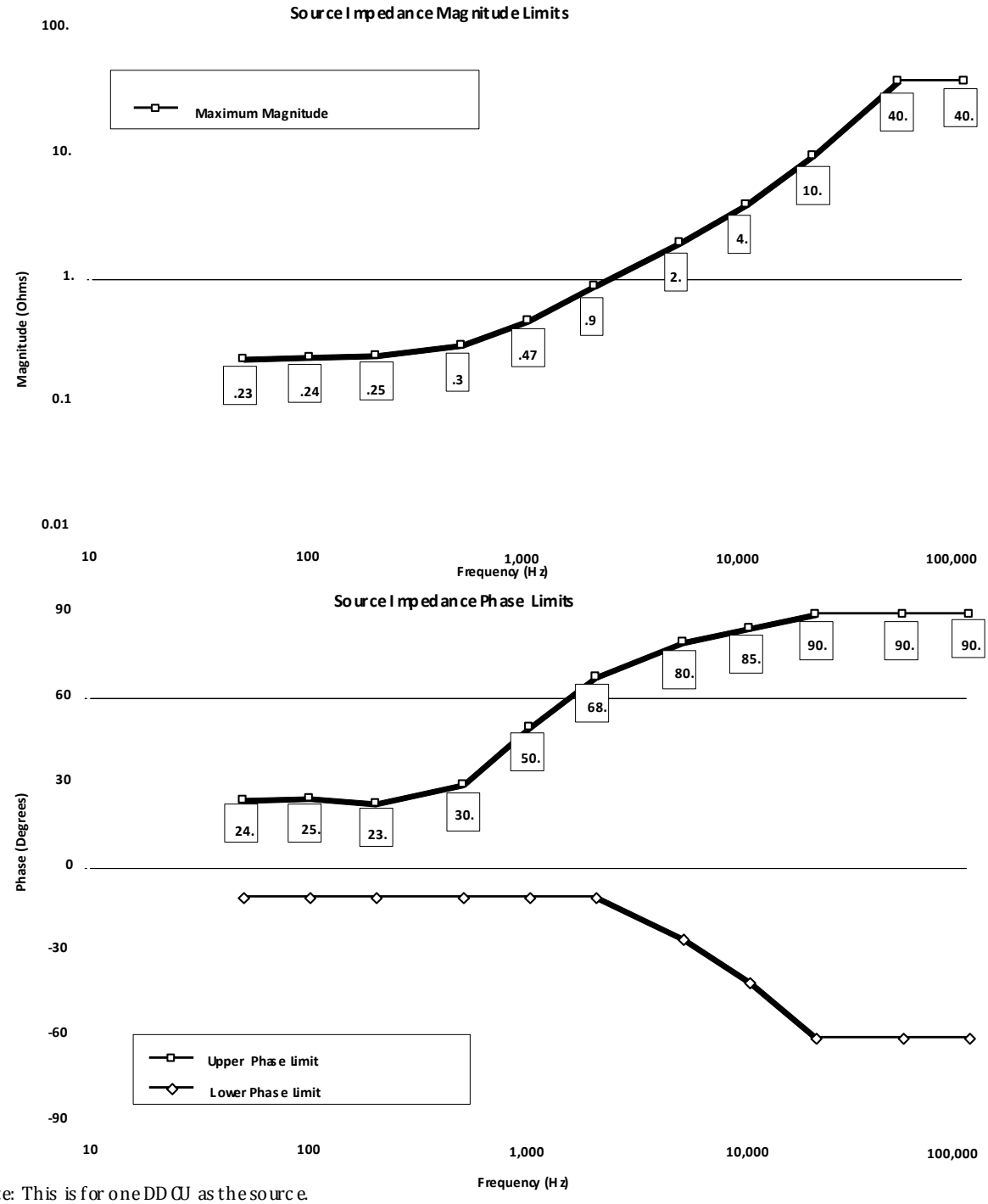


Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub−rack payload on the EPCU 120V outputs

FIGURE 3.2.5.1–3 FIR INPUT IMPEDANCE WITH 2KW LOAD ON THE SIX 120V OUTPUTS

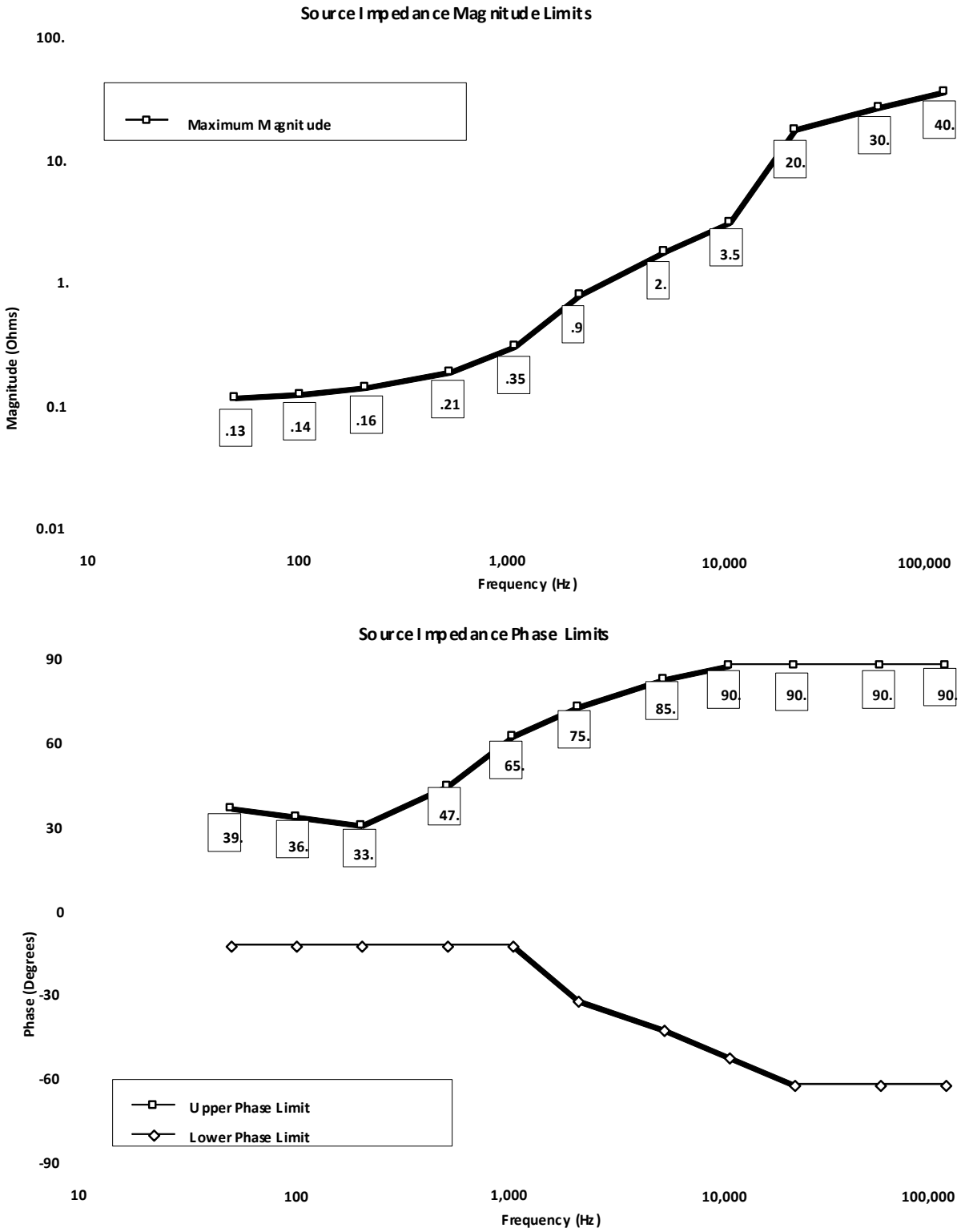
3.2.5.2 SOURCE IMPEDANCE LIMITS

The source impedance at UIP locations, except MPLM rack locations, will meet the limits as shown in Figures 3.2.5.2-1, 3.2.5.2-2 and 3.2.5.2-3.



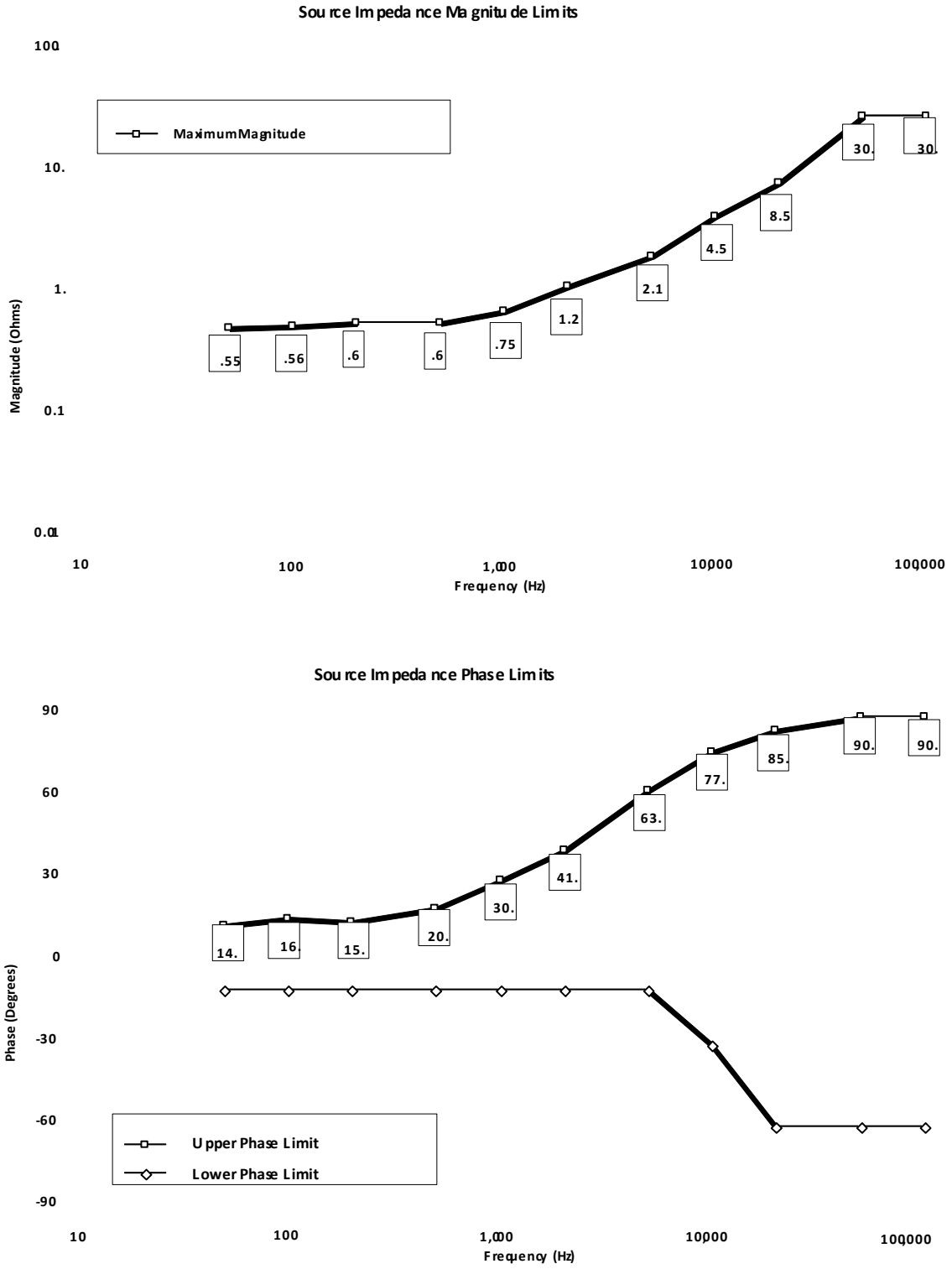
Note: This is for one DDCU as the source.

FIGURE 3.2.5.2-1 3 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS



Note: This is for one DDCU as the source.

FIGURE 3.2.5.2–2 6 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS



Note: This is for one DDCU as the source.

FIGURE 3.2.5.2–3 1.2-1.44KW INTERFACE B POWER SOURCE IMPEDANCE

3.2.6 REMOTE POWER CONTROLLER OVERLOAD LIMITS

Simultaneous Power consumption from both ISS busses is possible with the FIR EPCU. By utilizing ground initiated software commands, the EPCU can be configured to limit the total current drawn from either bus. If loads were turned on that would exceed this allocation, the EPCU provides load-shedding capabilities within 5ms of exceeding the power allocation. Following is an example of how the process would work.

Bus A is allocated 8A and Bus B is allocated 4A. Loads can be assigned a load-shed priority of 0 through 15, with 0 indicating never shed and 15 indicating the lowest priority or first to be shed. If two of the EPCU internal converters are assigned to Bus A and one is assigned to Bus B, two thirds of the total current draw will be on Bus A and one third will be on Bus B. When the Bus B allocation limit of 4A is reached, additional loads will cause Bus A current draw to increase only until its allocation limit of 8A is reached. At this point 8A are being drawn from Bus A and 4A are being drawn from Bus A. If for example another load is added that represents an additional 2A load, the following will happen. All loads that are assigned a priority of 15 will be turned off within 5ms, if after those loads are removed the bus allocation is still being exceeded, loads with priorities of 14 will be shut off within another 5ms. This process will continue until the power drawn is below the allocation limit.

Figures 3.2.6-1 and 3.2.6-2 show the upstream ISS Remote Power Controllers (RPCs) will not trip before the EPCU begins to shed loads. Figure 3.2.6-3 shows the amount of current drawn if one of the 120Vdc Flexible Remote Power Controllers (FRPCs) were shorted.
Table 3.2.6-1, Detailed Upstream Protection Characteristics, defines the characteristics of the remote power controllers.

The power characteristics defined in Table 3.2.7-1, FIR Power Characteristics, assume both the Main Feed and Auxiliary (AUX). Feed are allowed to provide power to the FIR simultaneously as described in the paragraph above. The total power drawn by the FIR is the sum of the Main and AUX power numbers shown in Table 3.2.7-1. FIR can limit the amount of power drawn from the AUX bus to whatever value ISS would want depending on power availability. Based on the values shown in Table 3.2.7-1 FIR would set the power allocation for the AUX bus to 12A for nominal operation.

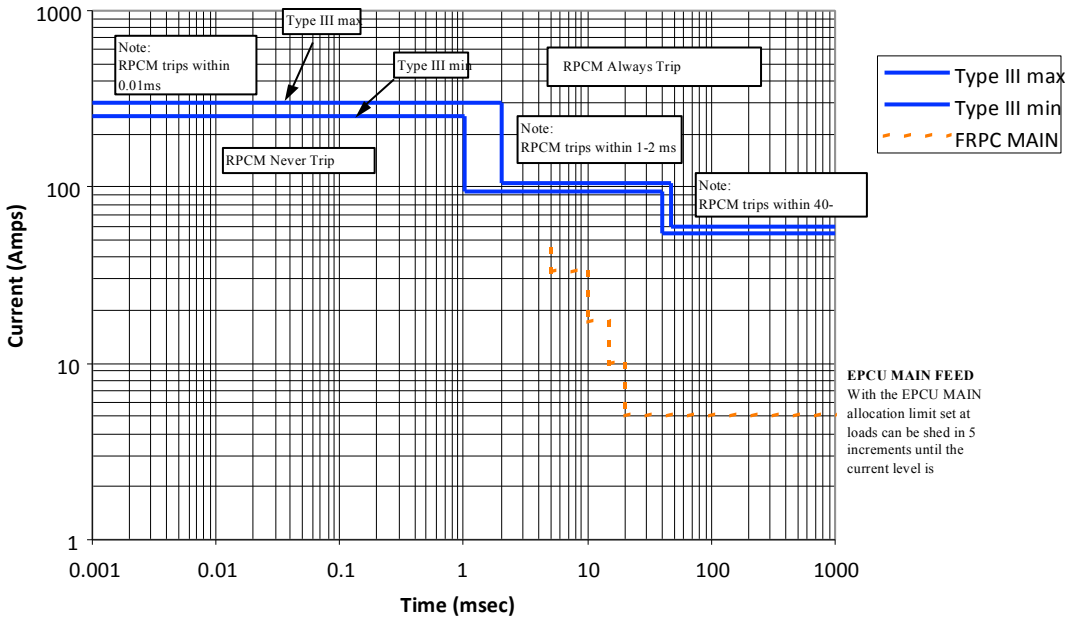


FIGURE 3.2.6-1 CIR ELECTRICAL POWER CONTROL UNIT (EPCU) LOAD SHEDDING

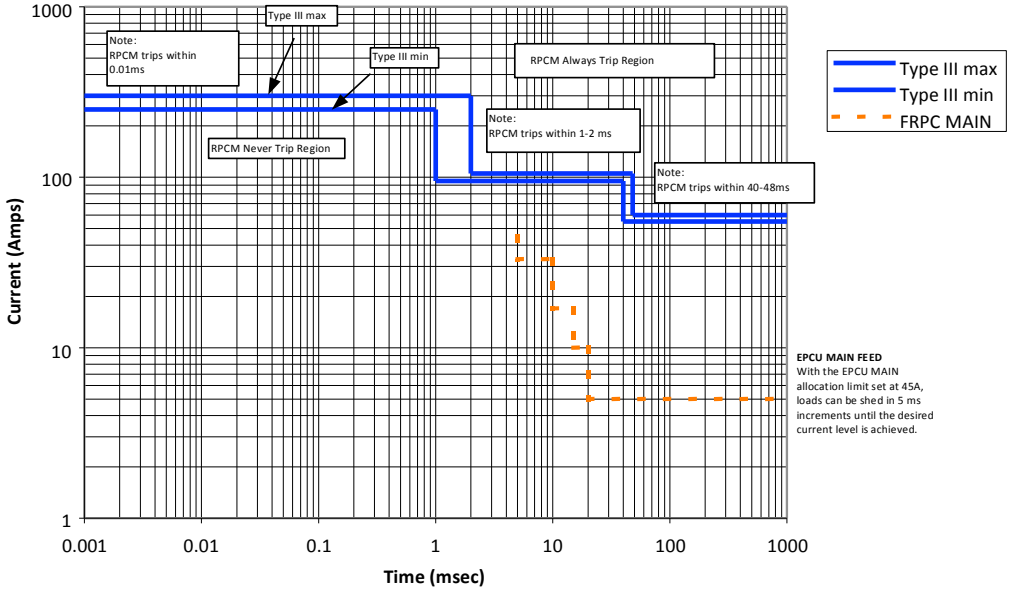
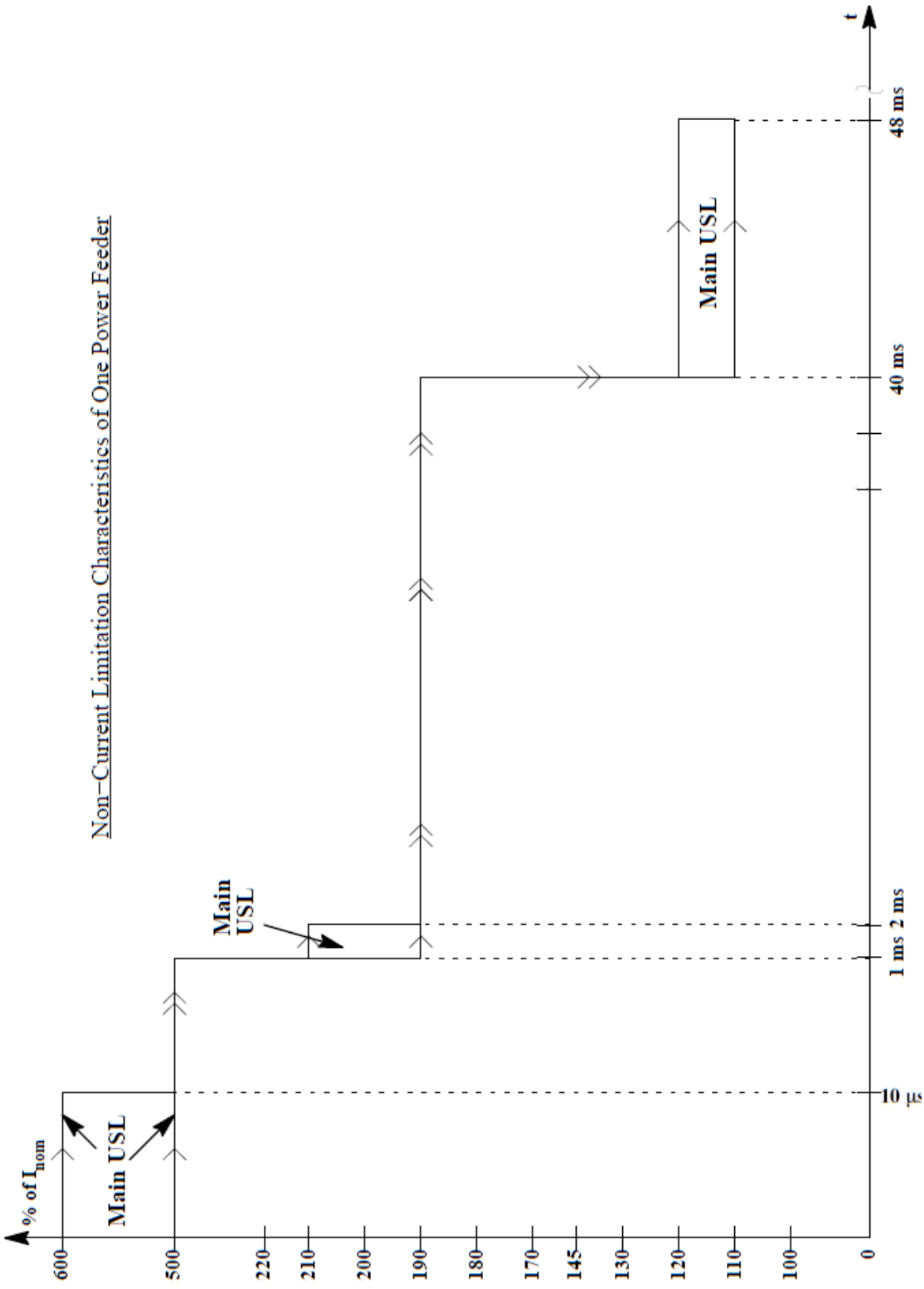


FIGURE 3.2.6–2 FIR ELECTRICAL POWER CONTROL UNIT (EPCU) FLEXIBLE REMOTE POWER CONTROLLER (FRPC) TRIP CHARACTERISTIC – FOR TYPE III RPCM


Non−Current Limitation Characteristics of One Power Feeder
% of I_{nom}
t
Main USL
Main USL
Main USL
600
500
220
210
200
190
180
170
145
130
120
110
100
0
10 µs
1 ms
2 ms
40 ms
48 ms

Note: Figures 3.2.6-1 and 3.2.6-2 show the trip coordination between ISS RPCMs and EPC load shedding. In this example, when the MAIN and AUX channel allocation limits are exceeded, pre-assigned output channels can be shed to bring the current draw down to an acceptable amount. Each step in the current shedding process takes 5ms. If a fault occurs c FRPC that does not cause the allocation limit on either channel to be exceeded, the fastest t the FRPC can turn off is 100 ms. The maximum amount of fault current an FRPC can outp 4.6A amperes for one channel, and multiples of this for paralleled channels. As defined in Figure 3.2.6-3, a 19A transient can exist for about 0.03 msec before the FRPC current limit 4.2 to 4.6A.

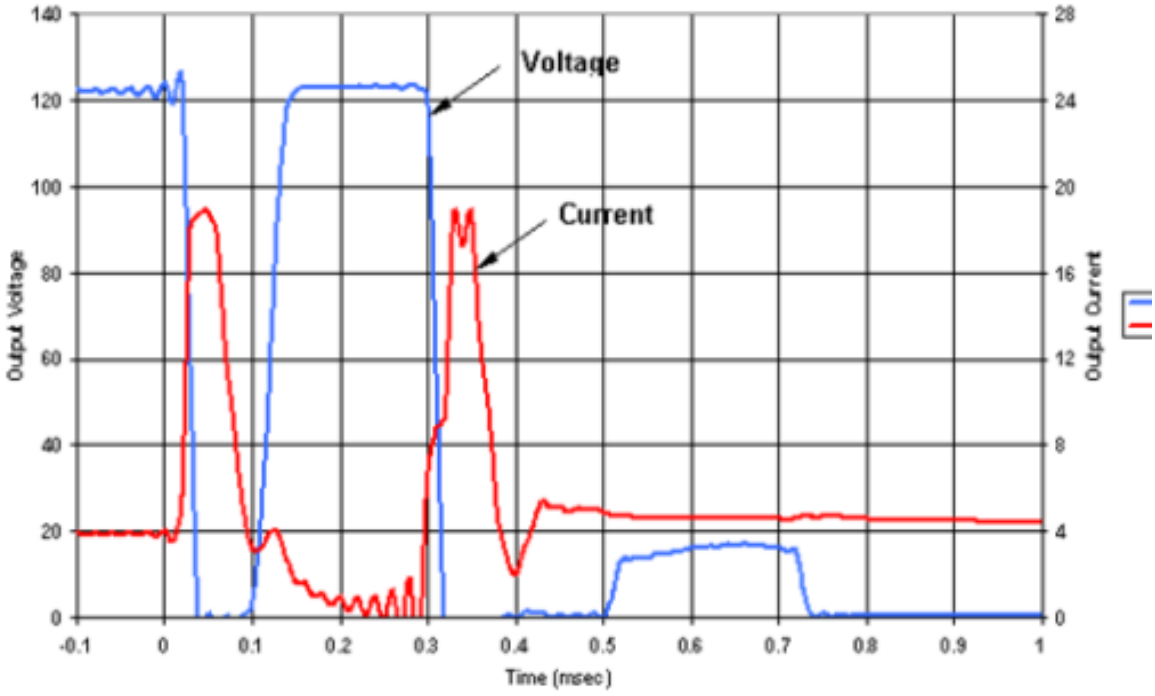


FIGURE 3.2.6-4 FLEXIBLE REMOTE POWER CONTROLLER (FRPC) 120 VDC SHO CIRCUIT CURRENT

Note: The graph shown in Figure 3.2.6-4, Flexible Remote Power Controller (FRPC) 120 V Short Circuit Current, represents actual test data showing the results of an applied fault to a V EPCU FRPC. The figure shows load current and voltage when a 4A FRPC load is shorte The input current will look the same, because there is no energy storage in the FRPC. The voltage is shown being clamped to zero by the fault. The device applying the fault bounced twice, allowing the voltage to recover to 120 V the first time, to about 20 V the second time then return to zero. In both cases, the current reached a maximum of less than 19 A. After second bounce, the fault lasts long enough to show the current reaching the steady state cur limiting value of a little more than 4 A, the current limit range is 4.2 A to 4.6 A. A cleaner would have resulted in a much cleaner current waveform, without the bounce. These result should be very typical, since the test was performed with the proper DDCU, RPCM, and fe impedance's.

TABLE 3.2.6-1 DETAILED UPSTREAM PROTECTION CHARACTERISTICS

PWR INTERFACE	MAIN PWR FEEDER				
	CURRENT IMITATION LEVEL		MINIMUM TRIP THRESHOLD	TRIP DECISION TIME (1)	
	MIN.	MAX.	MIN.	MIN.	MAX.
3 kW ISPR USL	N/A	N/A	27.5 A	40 ms	48 ms
6 kW ISPR USL	N/A	N/A	55.0 A	40 ms	48 ms
12 kW ISPR USL FEED A/BUS 1 FEED B/BUS 2	N/A N/A	N/A N/A	55.0 A 55.0 A	40 ms 40 ms	48 ms 48 ms
PWR INTERFACE	**AUX PWR FEEDER**				
	NOM. POWER	CURRENT LIMITATION LEVEL		TRIP DECISION TIME (1)	
		MIN.	MAX	MIN.	MAX.
ISPR USL	1.44kW	13.2A	14.4 A	31 ms	38 ms

Note 1: Trip decision time within range of minimum and maximum limiting/trip threshold.

3.2.7 ELECTRICAL POWER CONSUMING EQUIPMENT (EPCE) INTERFACE WITH THE UIP

The FIR power consumption and current draw is defined in Table 3.2.7-1, FIR Power Characteristics. The in-rush current for the FIR is shown in Figure 3.2.7-1. The surge current for the FIR is described in exception SSP 57218-NA-0020A. An electrical schematic of the FIR is provided in Figure 3.2.7-2*.

* Wires used for the main and auxiliary connections at the UIP represent an exception to the requirement found in SSP 57000, paragraph 3.2.3.1.C. Refer to 57202-NA-0017A. Table 5.1-1 provides the status of all exceptions.

Simultaneously power consumption from both Main and Auxiliary power busses is possible with the FIR EPCU. By utilizing ground initiated software commands, the EPCU can be configured to limit the total current drawn from either bus. If loads were turned on that would exceed this allocation, the EPCU provides load shedding capabilities within 5 ms.

Example:
Bus A is allocated 8 A and Bus B is allocated 4 A. Loads can be assigned a load shed priority of 0 through 15 (0 = never shed, 15 = first load to shed). Both buses draw power equally until Bus B reaches 4 A. As the loads increase beyond 4 A, Bus A will continue to draw current up to 8 A. At this point, 8 A is drawn by Bus A and 4 A is drawn by Bus B. If an additional 2 A load is added, loads with a priority of 15 will be turned off within 5 ms. If the bus allocation is still exceeded after the initial load shed, loads with a priority of 14 will be turned off. This process will continue until the current draw falls below the allocation. Each load shedding step occurs within 5 ms.

TABLE 3.2.7-1 FIR POWER CHARACTERISTICS

On-Orbit	POWER (WATTS) MAIN FEED			P/L Characteristics	CURRENT (Amps) MAIN FEED		POWER (WATTS) AUXILIARY FEED			CURRENT (Amps) AUXILIARY FEED	
	Peak	Max Cont	Keep Alive		Peak	Max Cont	Peak	Max Cont	Keep Alive/	Peak	Max Cont
Start-up/ Health Check	N/A	260	N/A	Continuous	N/A	2.2	N/A	260	N/A	N/A	2.2
Environment Preparation	N/A	352	N/A	Continuous	N/A	2.9	N/A	352	N/A	N/A	2.9
Experiment Operation	N/A	1050	N/A	Continuous	N/A	8.75	N/A	1050	N/A	N/A	8.75
Exhaust	N/A	707	N/A	Continuous	N/A	5.9	N/A	707	N/A	N/A	5.9
Data Processing	N/A	707	N/A	Continuous	N/A	5.9	N/A	707	N/A	N/A	5.9
Downlink	N/A	227	N/A	Continuous	N/A	1.9	N/A	227	N/A	N/A	1.9

Notes:
1. The FIR EPCU is designed to allow the use of power from both the Main and Auxiliary buses simultaneously to meet the FIR power requirements if power channelization analysis determines that the FIR power requirements cannot be met by a single bus.
2. Peak Power is defined as the highest power requirement lasting greater than 50 msec.
3. The power characteristics defined assume both Main and Auxiliary feeds can provide power to the FIR simultaneously as described in 3.2.7. The total power drawn by the FIR is the sum of the power drawn individually by the Main and Auxiliary power feeds. FIR can limit the power drawn from the Auxiliary feed to any value dependent upon power available. Based on the values shown above, FIR power allocation for the Auxiliary feed should be set to 8.75A.

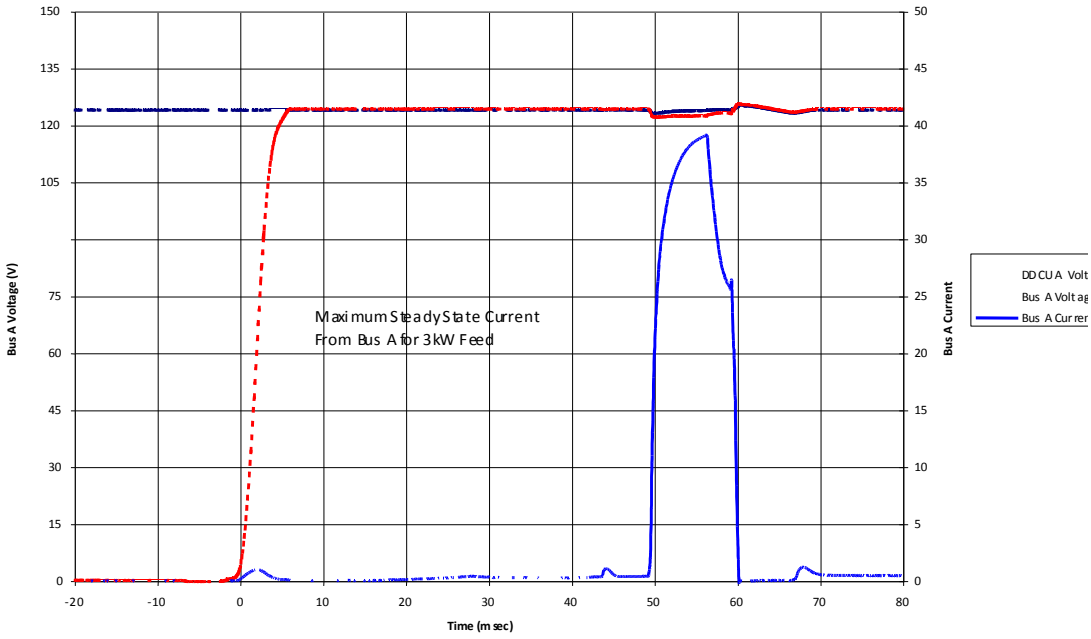


FIGURE 3.2.7–1 FIR IN–RUSH CURRENT

Note: The in-rush current shown in Figure 3.2.7-1 represents the current required to charge 2250 μF of filt capacitance on the input side of the 120 Vdc to 28 Vdc DC/DC converters inside the EPCU. This sp represents a worst case configuration with all three EPCU 1 kW converters connected to the same 120 Vdc input bus. The amplitude of this spike could be reduced by 1/3 or 2/3 if one or two of the converters were on the other bus during application of 120 Vdc.

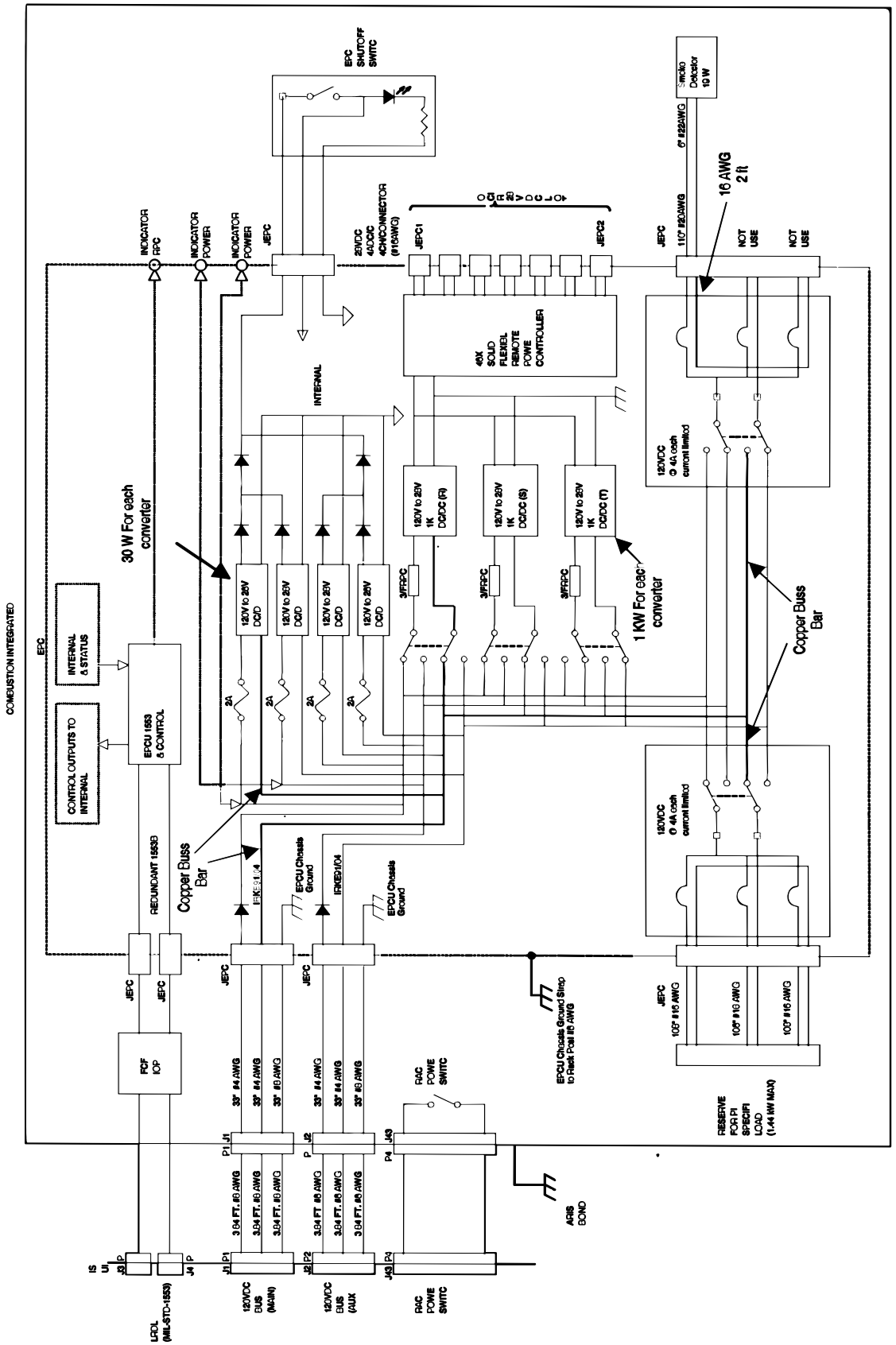


FIGURE 3.2.7-2 FIR ELECTRICAL SYSTEM BLOCK DIAGRAM

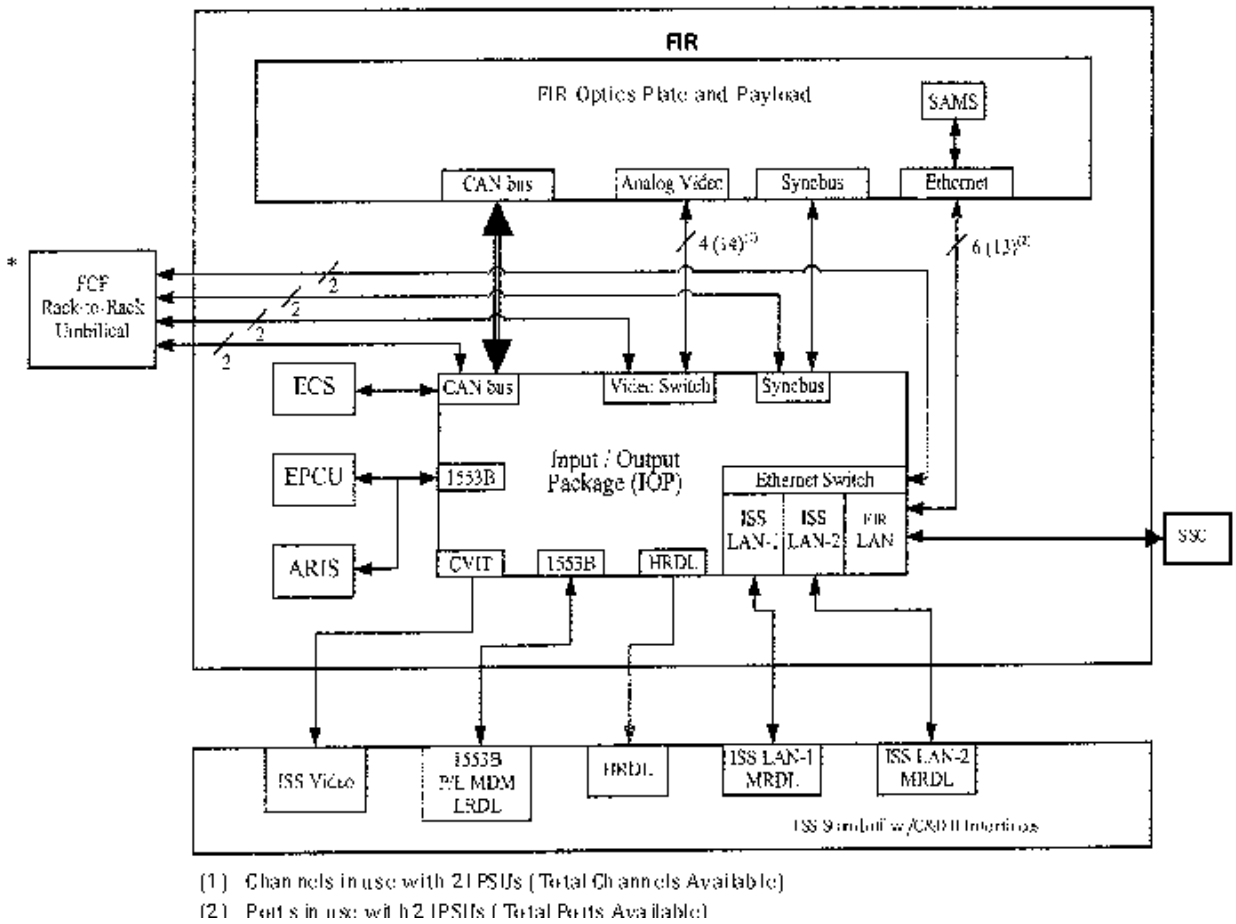
3.3 COMMAND AND DATA HANDLING INTERFACE REQUIREMENTS

This section applies to all payload commands and data on the Low Rate Data Link (LRDL), Medium Rate Data Link (MRDL), and High Rate Data Link (HRDL) and MDM supported analog and discrete measurements, including those necessary to interface with the Fire Detection and Suppression System.

3.3.1 GENERAL REQUIREMENTS

The following sections contain descriptions of the unique characteristics of rack data links. The combination of Integrated Data Flow Schematics and details provided in subsequent sections define routing, switching and electrical characteristics as required to perform payload operations and to support link level analysis, test and troubleshooting. FIR internal connectors and cables which require crew interaction for installation or on-orbit operation are also defined by location, connector pin function.

The Integrated Data Flow Schematic for the FIR is provided in Figure 3.3.1-1. Detailed Station Support Computer (SSC) interfaces are shown in Figure 3.3.1-2.



(1) Channels in use with 2 IPSUs (Total Channels Available)
(2) Ports in use with 2 IPSUs (Total Ports Available)

FIGURE 3.3.1-1 INTEGRATED DATA FLOW SCHEMATIC

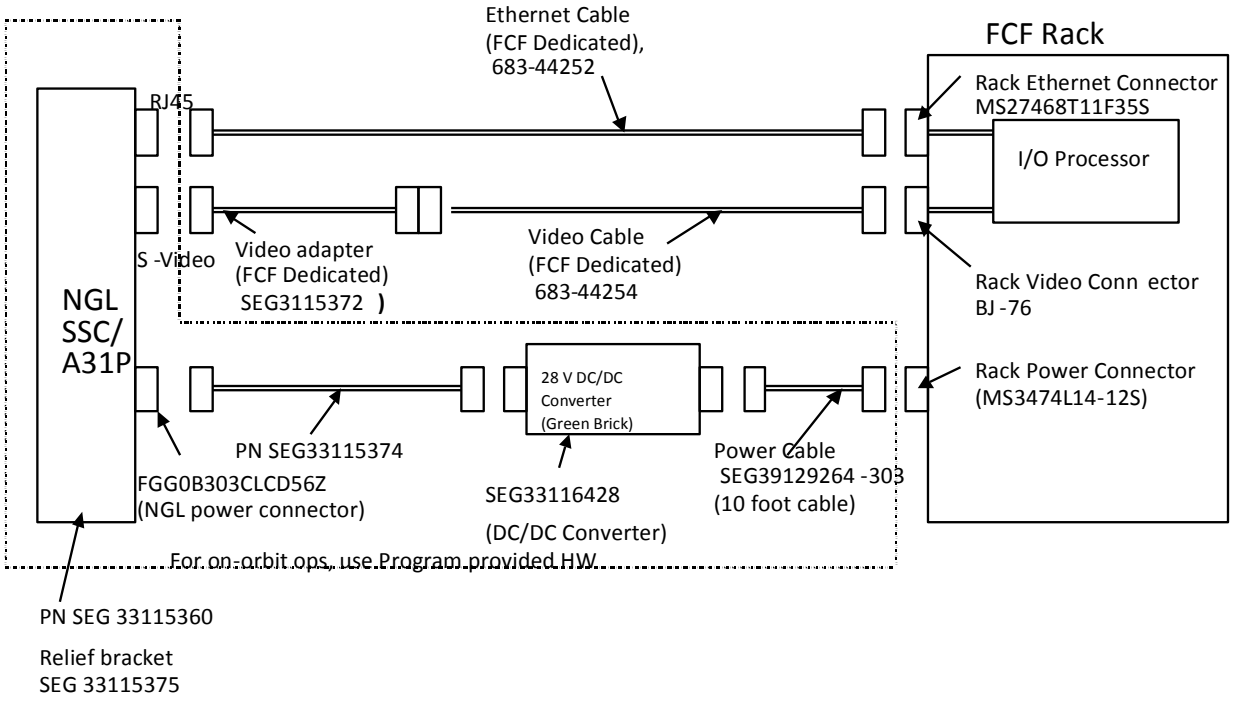


FIGURE 3.3.1-2 SSC/FCF END TO END CONFIGURATION

The FCF (CIR/FIR) will utilize a SSC for crew status and control of the FCF facilities. The SSC will be utilized to connect, via Ethernet, to FCF embedded web servers within the rack allowing display and command capability on the FCF homepage.

Note: While the SSC is being used for FCF Rack Command and Control, it will not be available for viewing procedures and flight plan information.

3.3.2 STANDARD PAYLOAD 1553B LOW RATE DATA LINK

The LRDL electrical interfaces will be in accordance with MIL-STD-1553B, using the interconnection requirements as specified in SSQ 22678.

3.3.2.1 ELECTRICAL INTERFACE

The FIR internal wiring stub length, as defined in MIL-STD-1553B, is listed in Table 3.3.2.1-1, FIR LRDL Electrical Characteristics.

TABLE 3.3.2.1-1 FIR LRDL ELECTRICAL CHARACTERISTICS

	Recommended	Actual
Type	Twisted Shielded	
*** Stub Length**	<= 12 Feet	75 inches
***** Measured from the RT to the ISPR Utility Interface Panel		

*The Rack-to-Rack umbilicals represent an exception to requirements found in SSP 57000, paragraph 3.1.1.7.A. Refer to SSP 57217-NA-0029B. Table 5.1-1 provides the status of all exceptions that apply to FIR.

3.3.2.2 CONNECTORS

The FIR 1553B bus connectors to the UIP, J3 and J4, pin assignments are shown in Figures 3.3.2.2-1 and 3.3.2.2-2, respectively. The MIL-STD-1553B bus connectors are defined in Table 3.1.2-1.

The integrated rack 1553B bus connectors to the UOP, J3 and J4, pin assignments are not applicable to the FIR.

UTILITY I/F PANEL NATC07T15N35SN OR 340105601 B07-15-35SN			ISPR NATC06G15N35PN (NASA SSQ 21635)*
1553 BUS A	J3	P3	
STANDARD P/L BUS BIT0 ADDRESS (USL)	1	1	STANDARD P/L BUS BIT0 ADDRESS (USL)
STANDARD P/L BUS BIT1 ADDRESS (USL)	2	2	STANDARD P/L BUS BIT1 ADDRESS (USL)
STANDARD P/L BUS BIT2 ADDRESS (USL)	3	3	STANDARD P/L BUS BIT2 ADDRESS (USL)
STANDARD P/L BUS BIT3 ADDRESS (USL)	4	4	STANDARD P/L BUS BIT3 ADDRESS (USL)
STANDARD P/L BUS BIT4 ADDRESS (USL)	5	5	STANDARD P/L BUS BIT4 ADDRESS (USL)
STANDARD P/L BUS PARITY (USL)	6	6	STANDARD P/L BUS PARITY (USL)
STANDARD P/L BUS LOGIC GND (USL)	7	7	STANDARD P/L BUS LOGIC GND (USL)
SPARE	8	8	Not Used
JEM MOD. SPEC. P/L1 BUS BIT0 ADDRESS	9	9	Not Used
JEM MOD. SPEC. P/L1 BUS BIT1 ADDRESS	10	10	Not Used
JEM MOD. SPEC. P/L1 BUS BIT2 ADDRESS	11	11	Not Used
JEM MOD. SPEC. P/L1 BUS BIT3 ADDRESS	12	12	Not Used
JEM MOD. SPEC. P/L1 BUS BIT4 ADDRESS	13	13	Not Used
JEM MOD. SPEC. P/L1 BUS PARITY	14	14	Not Used
JEM MOD. SPEC. P/L1 BUS LOGIC GND	15	15	Not Used
SPARE	16	16	Not Used
JEM MOD. SPEC. P/L3 BUS BIT0 ADDRESS	17	17	Not Used
JEM MOD. SPEC. P/L3 BUS BIT1 ADDRESS	18	18	Not Used
JEM MOD. SPEC. P/L3 BUS BIT2 ADDRESS	19	19	Not Used
JEM MOD. SPEC. P/L3 BUS BIT3 ADDRESS	20	20	Not Used
JEM MOD. SPEC. P/L3 BUS BIT4 ADDRESS	21	21	Not Used
JEM MOD. SPEC. P/L3 BUS PARITY	22	22	Not Used
JEM MOD. SPEC. P/L3 BUS LOGIC GND	23	23	Not Used
SPARE	24	24	Not Used
COL MODULE SPECIFIC P/L BUS A-	25	25	Not Used
COL MODULE SPECIFIC P/L BUS A+	26	26	Not Used
JEM MODULE SPECIFIC P/L4 1553B BUS A-	27	27	Not Used
JEM MODULE SPECIFIC P/L4 1553B BUS A+	28	28	Not Used
JEM MODULE SPECIFIC P/L3 1553B BUS A-	29	29	Not Used
JEM MODULE SPECIFIC P/L3 1553B BUS A+	30	30	Not Used
SPARE	31	31	Not Used
JEM MODULE SPECIFIC P/L2 1553B BUS A-	32	32	Not Used
JEM MODULE SPECIFIC P/L2 1553B BUS A+	33	33	Not Used
JEM MODULE SPECIFIC P/L1 1553B BUS A-	34	34	Not Used
JEM MODULE SPECIFIC P/L1 1553B BUS A+	35	35	Not Used
STANDARD P/L 1553B BUS A- (USL)	36	36	STANDARD P/L 1553B BUS A- (USL)
STANDARD P/L 1553B BUS A+ (USL)	37	37	STANDARD P/L 1553B BUS A+ (USL)

NOTE: Data buses are controlled impedance twisted shielded pairs with the shield terminated on the connector backshell.

NOTE: The bus address logic ground will be connected to the ISPR Remote Terminal logic ground

FIGURE 3.3.2.2-1 PAYLOAD 1553B BUS A CONNECTOR PIN / ASSIGNMENT - J3

UTILITY I/F PANEL NATC07T15N35SA OR 340105601B07-15-35SA			ISPR NATC06G15N35PA (NASA SSQ 21635) OR 340105601B06-15-35PA (ESA SSC 3401/056)
1553 BUS B	J4	P4	
COL MOD. SPEC. P/L BUS BIT0 ADDRESS	1	1	Not Used
COL MOD. SPEC. P/L BUS BIT1 ADDRESS	2	2	Not Used
COL MOD. SPEC. P/L BUS BIT2 ADDRESS	3	3	Not Used
COL MOD. SPEC. P/L BUS BIT3 ADDRESS	4	4	Not Used
COL MOD. SPEC. P/L BUS BIT4 ADDRESS	5	5	Not Used
COL MOD. SPEC. P/L BUS PARITY	6	6	Not Used
COL MOD. SPEC. P/L BUS LOGIC GND	7	7	Not Used
SPARE	8	8	Not Used
JEM MOD. SPEC. P/L2 BUS BIT0 ADDRESS	9	9	Not Used
JEM MOD. SPEC. P/L2 BUS BIT1 ADDRESS	10	10	Not Used
JEM MOD. SPEC. P/L2 BUS BIT2 ADDRESS	11	11	Not Used
JEM MOD. SPEC. P/L2 BUS BIT3 ADDRESS	12	12	Not Used
JEM MOD. SPEC. P/L2 BUS BIT4 ADDRESS	13	13	Not Used
JEM MOD. SPEC. P/L2 BUS PARITY	14	14	Not Used
JEM MOD. SPEC. P/L2 BUS LOGIC GND	15	15	Not Used
SPARE	16	16	Not Used
JEM MOD. SPEC. P/L4 BUS BIT0 ADDRESS	17	17	Not Used
JEM MOD. SPEC. P/L4 BUS BIT1 ADDRESS	18	18	Not Used
JEM MOD. SPEC. P/L4 BUS BIT2 ADDRESS	19	19	Not Used
JEM MOD. SPEC. P/L4 BUS BIT3 ADDRESS	20	20	Not Used
JEM MOD. SPEC. P/L4 BUS BIT4 ADDRESS	21	21	Not Used
JEM MOD. SPEC. P/L4 BUS PARITY	22	22	Not Used
JEM MOD. SPEC. P/L4 BUS LOGIC GND	23	23	Not Used
SPARE	24	24	Not Used
COL MODULE SPECIFIC 1553B P/L BUS B-	25	25	Not Used
COL MODULE SPECIFIC 1553B P/L BUS B+	26	26	Not Used
JEM MODULE SPECIFIC P/L4 1553B BUS B-	27	27	Not Used
JEM MODULE SPECIFIC P/L4 1553B BUS B+	28	28	Not Used
JEM MODULE SPECIFIC P/L3 1553B BUS B-	29	29	Not Used
JEM MODULE SPECIFIC P/L3 1553B BUS B+	30	30	Not Used
SPARE	31	31	Not Used
JEM MODULE SPECIFIC P/L2 1553B BUS B-	32	32	Not Used
JEM MODULE SPECIFIC P/L2 1553B BUS B+	33	33	Not Used
JEM MODULE SPECIFIC P/L1 1553B BUS B-	34	34	Not Used
JEM MODULE SPECIFIC P/L1 1553B BUS B+	35	35	Not Used
STANDARD P/L 1553B BUS B- (USL)	36	36	STANDARD P/L 1553B BUS B- (USL)
STANDARD P/L 1553B BUS B+ (USL)	37	37	STANDARD P/L 1553B BUS B+ (USL)

NOTE: Data buses are controlled impedance twisted shielded pairs with the shield terminated on the connector backshell.

NOTE: The bus address logic ground will be connected to the ISPR Remote Terminal logic ground.

FIGURE 3.3.2.2–2 PAYLOAD 1553B BUS B CONNECTOR / PIN ASSIGNMENT – J4

3.3.3 MEDIUM RATE DATA LINK (MRDL)

3.3.3.1 CONNECTORS

The FIR MRDL connectors, J46 and J47, pin assignments are shown in Figures 3.3.3.1-1 and 3.3.3.1-2, respectively. The ISS Payload MRDL Architecture is shown in Figure 3.3.3.1-3. The MRDL connectors are defined in Table 3.1.2-1.

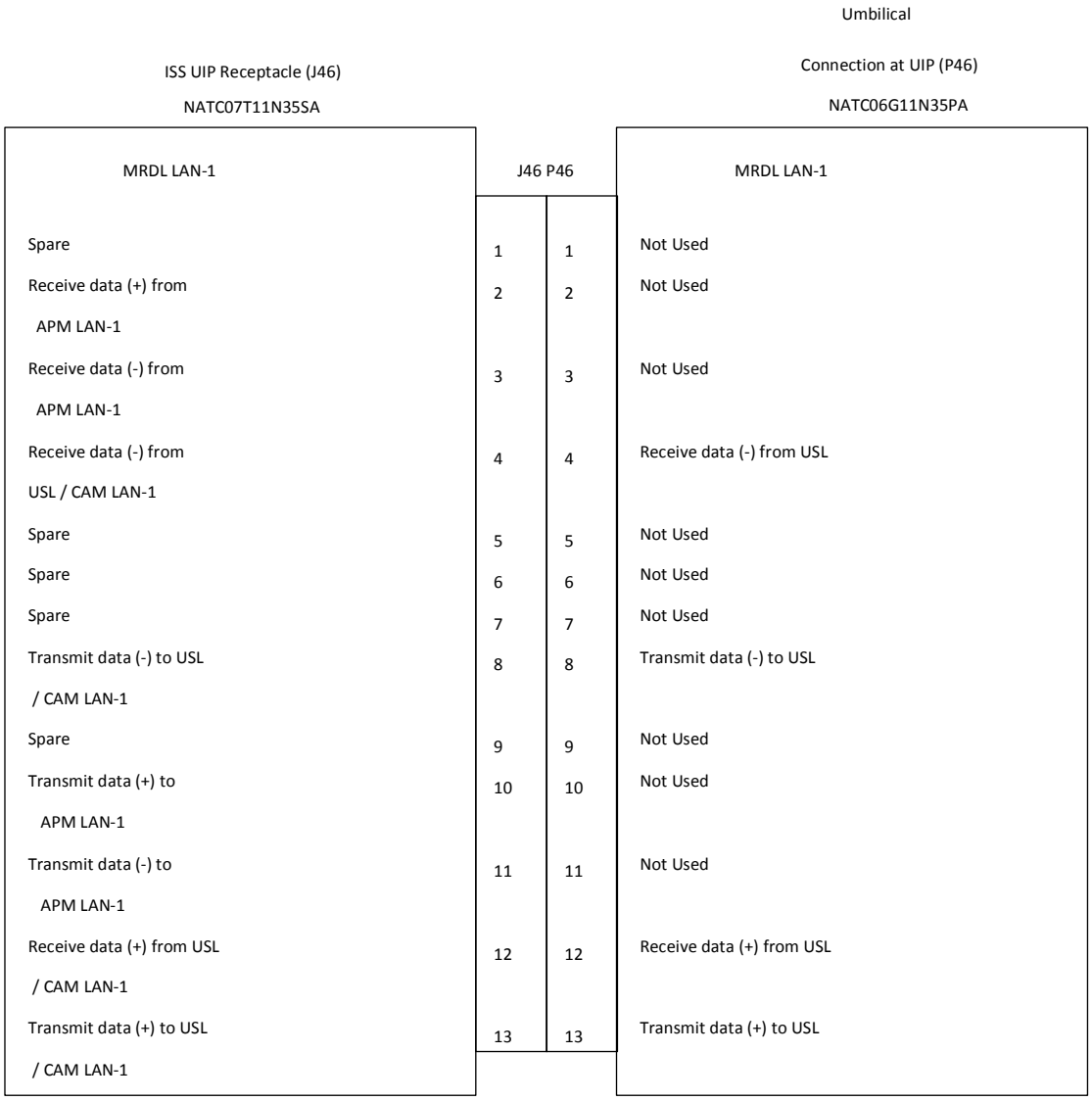


FIGURE 3.3.3.1–1 USL LAN–1 INTERFACE CONNECTOR / PIN ASSIGNMENT – J46

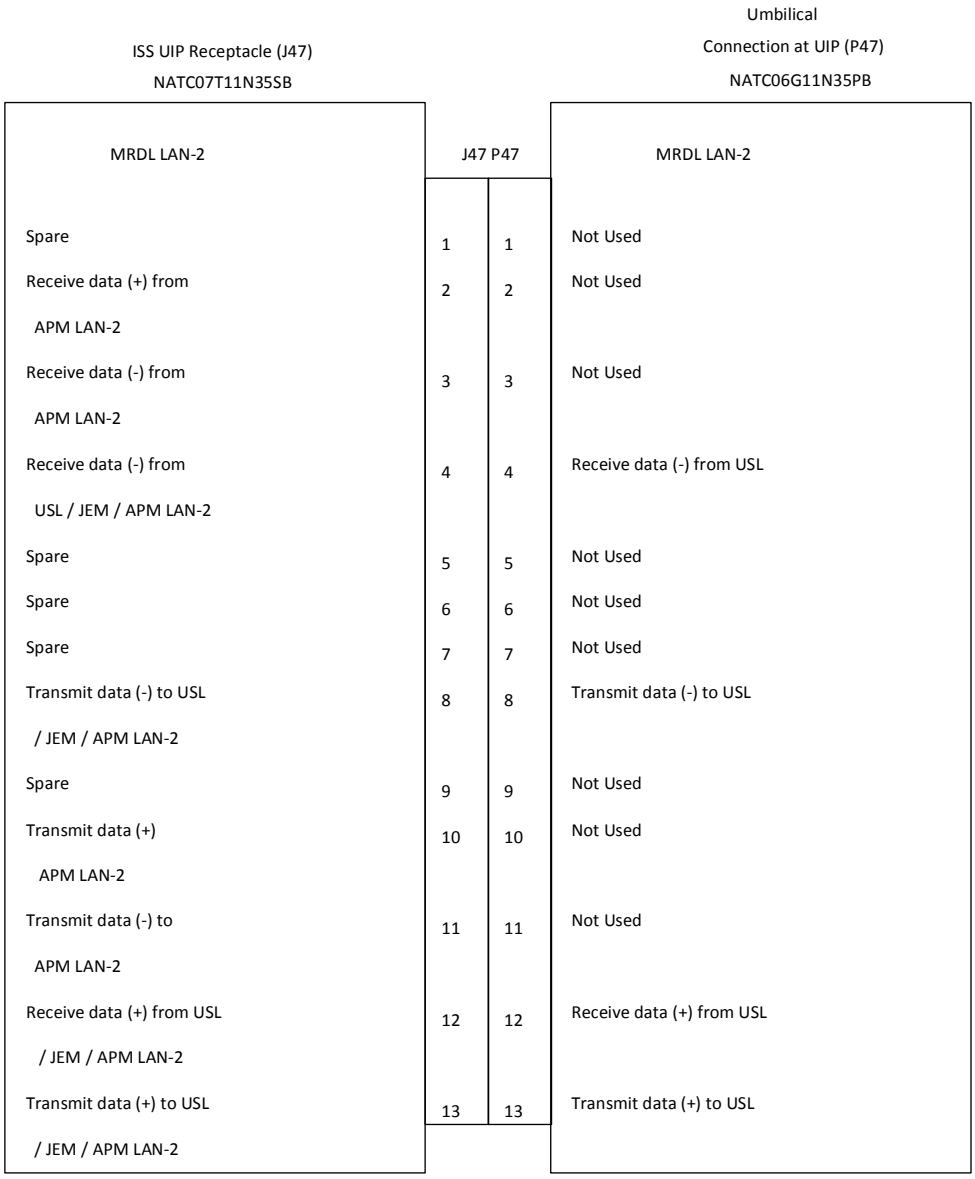


FIGURE 3.3.3.1–2 USL LAN–2 INTERFACE CONNECTOR / PIN ASSIGNMENT – J47

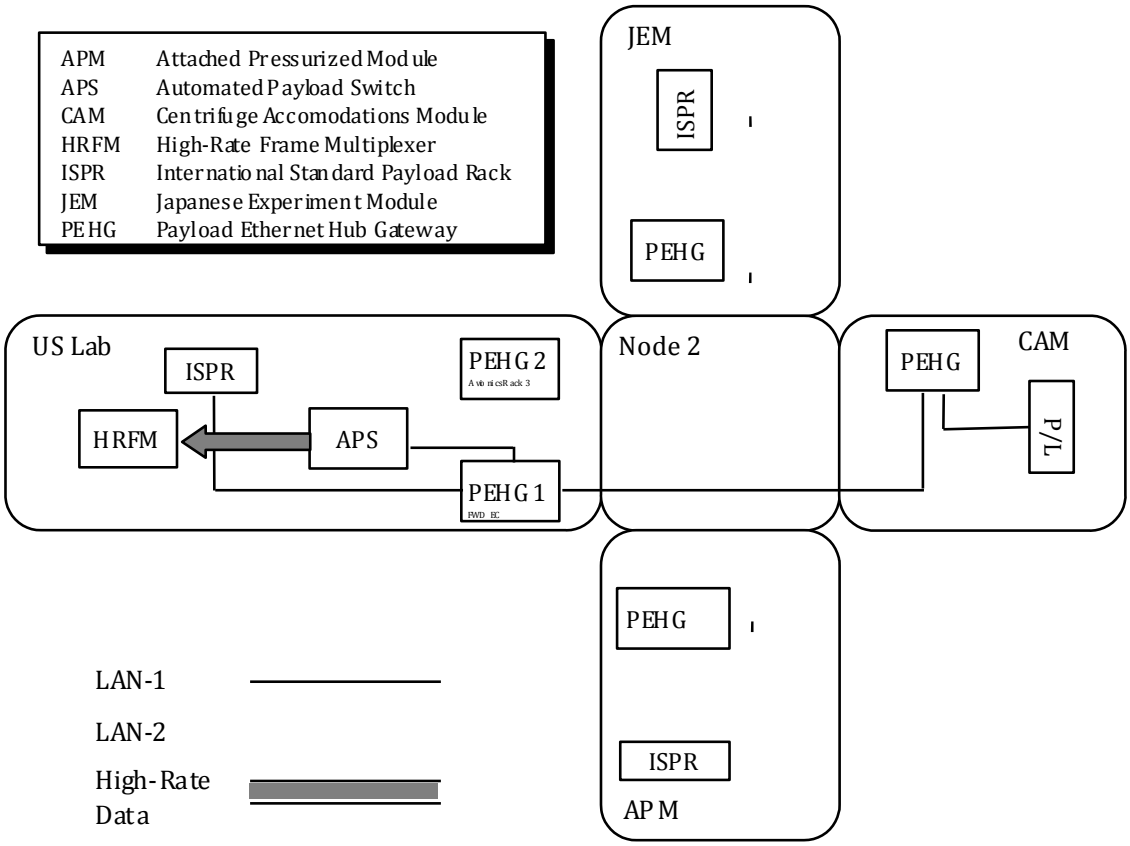


FIGURE 3.3.3.1–3 ISS PAYLOAD MRDL ARCHITECTURE

3.3.3.2 ELECTRICAL INTERFACE

The FIR internal MRDL wiring stub length is listed in Table 3.3.3.2-1.

TABLE 3.3.3.2-1 FIR MRDL WIRING STUB LENGTH

	Recommended	Actual
Type	Twisted Shielded	
Cable Length	<= 16.4 feet	84 inches

3.3.4 HIGH RATE DATA LINK (HRDL)

3.3.4.1 CONNECTOR

The FIR HRDL connector, J7, pin assignments are shown in Figure 3.3.4.1-1. The HRDL bus connector is defined in Table 3.1.2-1.

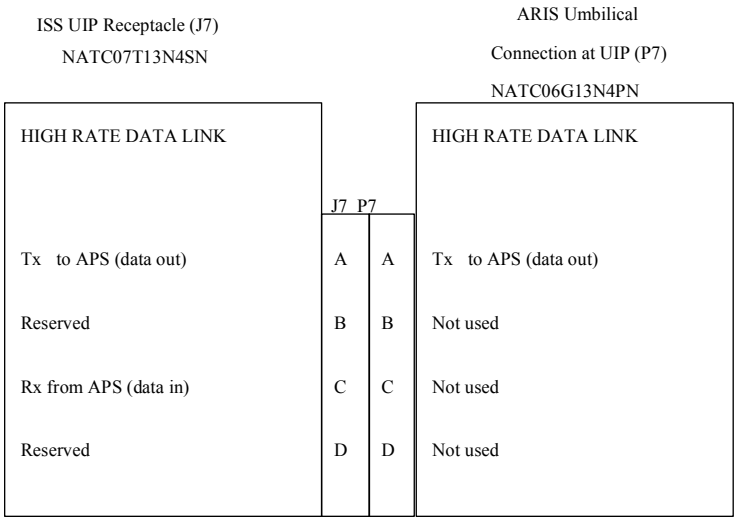


FIGURE 3.3.4.1-1 STANDARD HIGH RATE DATA CONNECTOR PART NUMBER AND PIN ASSIGNMENT - J7

3.3.4.2 FIBER OPTIC SIGNAL CHARACTERISTICS

The FIR Fiber Optic signal power at the HRDL J7 interface is: -14.05 dBm.

3.3.5 FDS / MAINTENANCE (POWER) SWITCH INTERFACE

3.3.5.1 CONNECTOR

The FIR fire detection support and Rack Maintenance (rack power) switch signals connector, J43, pin assignments are shown in Figure 3.3.5.1-1. The fire detection support and power removal switch connector is defined in Table 3.1.2-1.

ISS UIP NATC07T13N35SA MAINT. SWITCH / FIRE DETECTION SUPPORT INTERFACE	J43	P43	ISPR NATC06G13N35PA MAINT. SWITCH / FIRE DETECTION SUPPORT INTERFACE
Smoke Detection Scatter (-)	1	1	Smoke Detection Scatter (-)
Spare	2	2	Not Used
Spare	3	3	Not Used
Spare	4	4	Not Used
Spare	5	5	Not Used
Spare	6	6	Not Used
Spare	7	7	Not Used
Spare	8	8	Not Used
Spare	9	9	Not Used
Spare	10	10	Not Used
Spare	11	11	Not Used
Fan Ventilation Indicator (+)	12	12	Fan Ventilation Indicator (+)
Fan Ventilation Indicator (-)	13	13	Fan Ventilation Indicator (-)
Smoke Detection Scatter (+)	14	14	Smoke Detection Scatter (+)
Smoke Indicator Command (-)	15	15	Smoke Indicator Command (-)
Smoke Detection Obscuration (+)	16	16	Smoke Detection Obscuration (+)
Smoke Detection Obscuration (-)	17	17	Smoke Detection Obscuration (-)
Smoke Detection Bit Enable (-)	18	18	Smoke Detection Bit Enable (-)
Power Removal Switch Position (-)	19	19	Power Removal Switch Position (-)
Power Removal Switch Position (+)	20	20	Power Removal Switch Position (+)
Smoke Indicator Command (+)	21	21	Smoke Indicator Command (+)
Smoke Detection Bit Enable (+)	22	22	Smoke Detection Bit Enable (+)

FIGURE 3.3.5.1-1 FIR POWER REMOVAL SWITCH / FIRE DETECTION SUPPORT INTERFACE CONNECTOR / PIN ASSIGNMENTS - J43

3.3.5.2 SMOKE SENSOR CIRCUIT CHARACTERISTICS

The interface for the FIR smoke detector is as depicted in the simplified schematic of Figure 3.3.5.2-1, Principal Circuit for the Smoke Sensor Interface. FIR smoke detector functional characteristics are shown in Table 3.3.5.2-1.

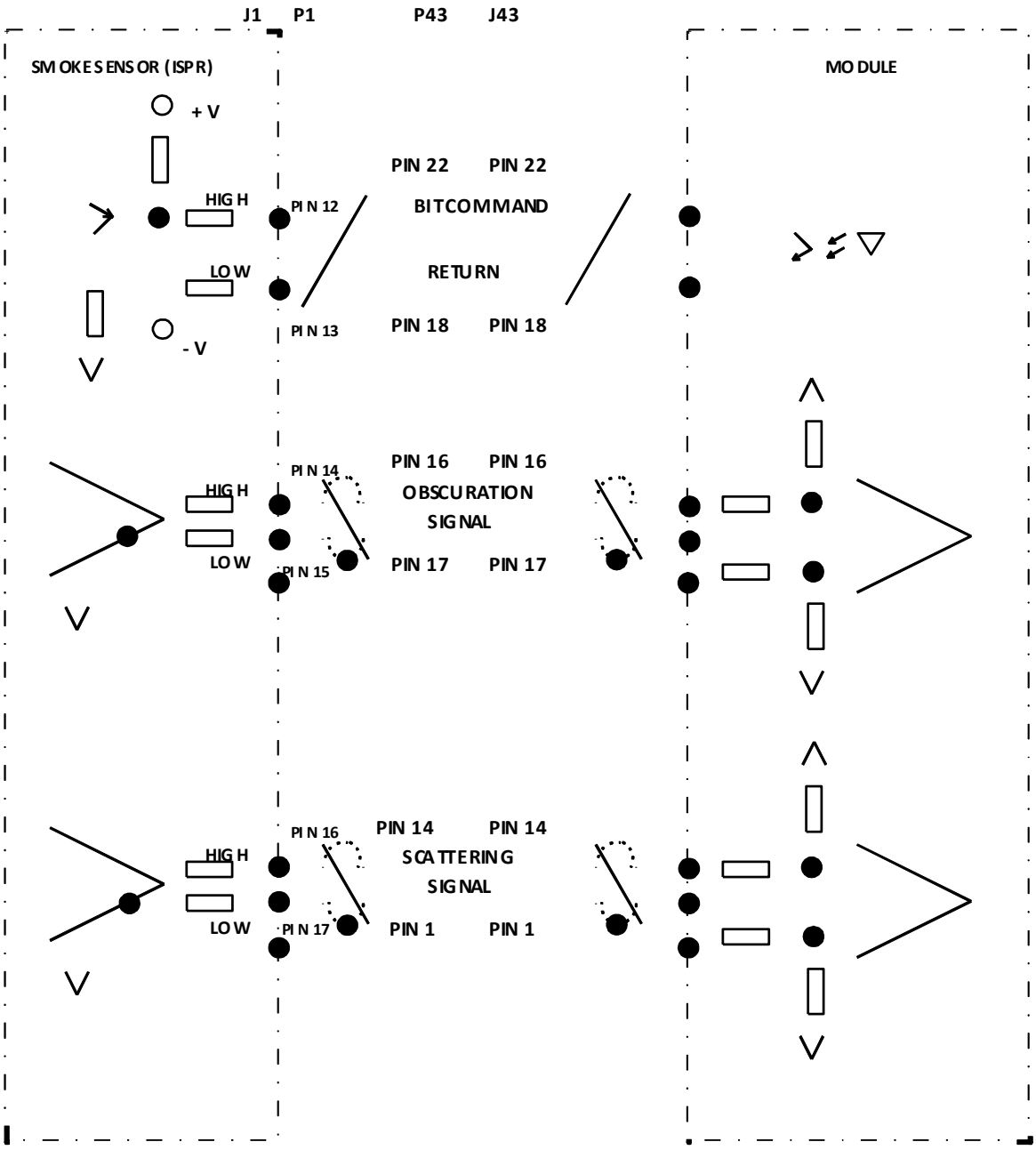


FIGURE 3.3.5.2–1 PRINCIPAL CIRCUIT FOR THE SMOKE SENSOR INTERFACE

TABLE 3.3.5.2-1 SMOKE DETECTION SUPPORT FUNCTIONAL CHARACTERISTICS

TYPE	SIGNAL NAME	SIGNAL TYPE	CONDITION	SIGNAL RANGE	VOLTAGE RANGE (SIGNAL RANGE) NOMINAL
Smoke Detector	BIT input	Discrete	Nominal	Open (high)	V= +5.0 Vdc
Smoke Detector	BIT input	Discrete	BIT ON	Closed (low)	V< +5.0 Vdc
Smoke Detector	Obscuration Output	Analog	Nominal	0 to 100% light attenuation	V= +4 to -4 Vdc
Smoke Detector	Obscuration Output	Analog	BIT ON	Laser OFF	V< -3.8 Vdc
Smoke Detector	Scatter output	Analog	Nominal	0 to 2% OBS/ ft	0 to 4.5 Vdc
Smoke Detector	Scatter output	Analog	BIT ON	0.9 to 2.1 % OBS/ ft	1.8 to 4.2 Vdc
Smoke Detector	Scatter output	Analog	BIT Off (Quiet Period)	0% OBS/ ft	0 to 0.5 Vdc
FAN Ventilation	Ventilation output	Analog	Nominal	+/ - 5 Vdc	+/ - 5 Vdc
Smoke Indicator	Indication input	Discrete	N/ A	N/ A	N/ A

The rack air flow threshold voltage for smoke-detection is 5.5 Vdc.

The circuit diagram for the fan ventilation and smoke indicator LED is shown in Figure 3.3.5.2-2.

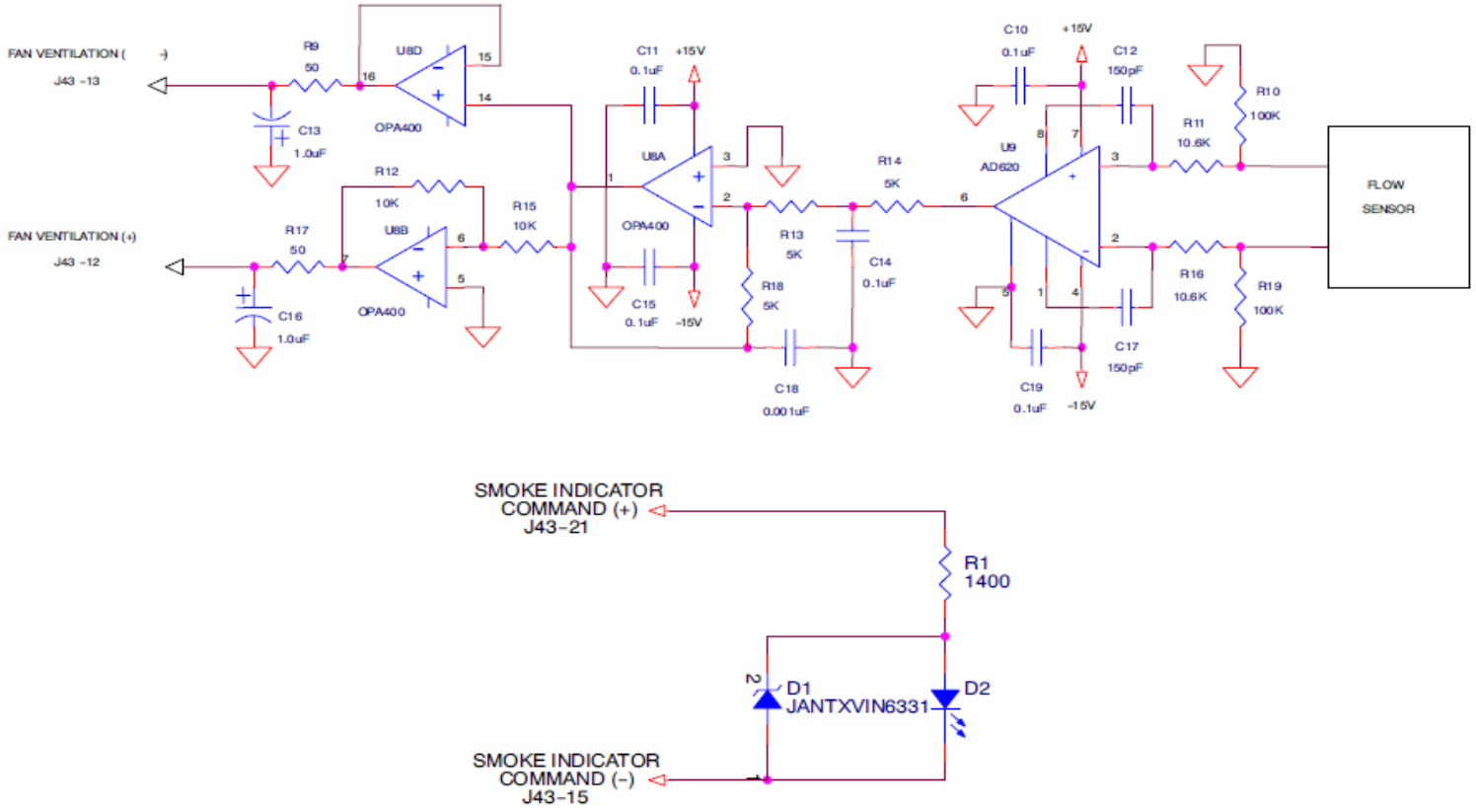


FIGURE 3.3.5.2–2 FAN VENTILATION AND SMOKE INDICATOR LED CIRCUIT

3.3.5.3 RACK MAINTENANCE (POWER) SWITCH CIRCUIT CHARACTERISTICS

The USL provides, at each ISPR location, one switch closure command line for switching off the main/auxiliary power feeds implemented at the J43 connector. The interface for the Rack Maintenance Switch is depicted in the simplified schematic in Figure 3.3.5.3-1.

In the USL, up (Off) position closes the circuit on J43 pin 19 & 20. When the circuit on J43, pin 19 & 20 is closed, the RPC is commanded open which initiates the removal of power for a specific ISPR location. In the USL, down (On) position open the circuit on J43, pin 19 and 20. When the circuit on J43, pin 19 & 20 is open, it removes the inhibit that prevents the RPC from restoring power to the rack. However, the RPC must be commanded on (closes RPC) again, either by the ground or by the crew.

3.4 PAYLOAD VIDEO INTERFACE REQUIREMENTS

This section is limited to internal video interfaces. The USL provides a fiber optic video interface. The MPLM does not have video.

3.4.1 NTSC FIBER OPTIC VIDEO

3.4.1.1 PULSE FREQUENCY MODULATION NTSC FIBER OPTIC VIDEO CHARACTERISTICS

The Pulse Frequency Modulation (PFM) fiber optical video interface consists of one video channel into the rack, one video channel out of the rack, and one synchronization and control channel.

3.4.1.2 PFM NTSC OPTICAL CONNECTOR

The FIR PFM NTSC video optical connector, J16 pin assignments are shown in Figure 3.4.1.2-1. The location of the video optical connector, J16, interface at the UIP is defined in Figures 3.1.2-1 and 3.1.2-2. The video optical connector is defined in Table 3.1.2-1.

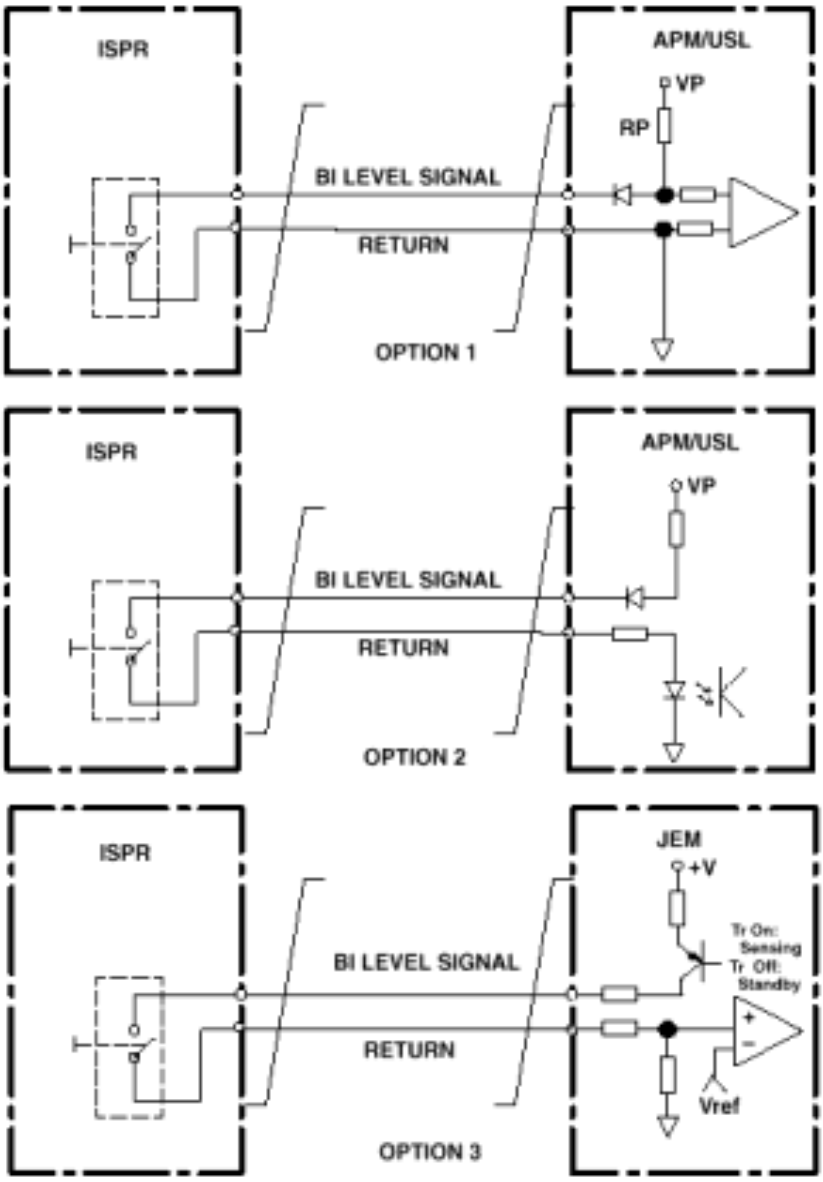
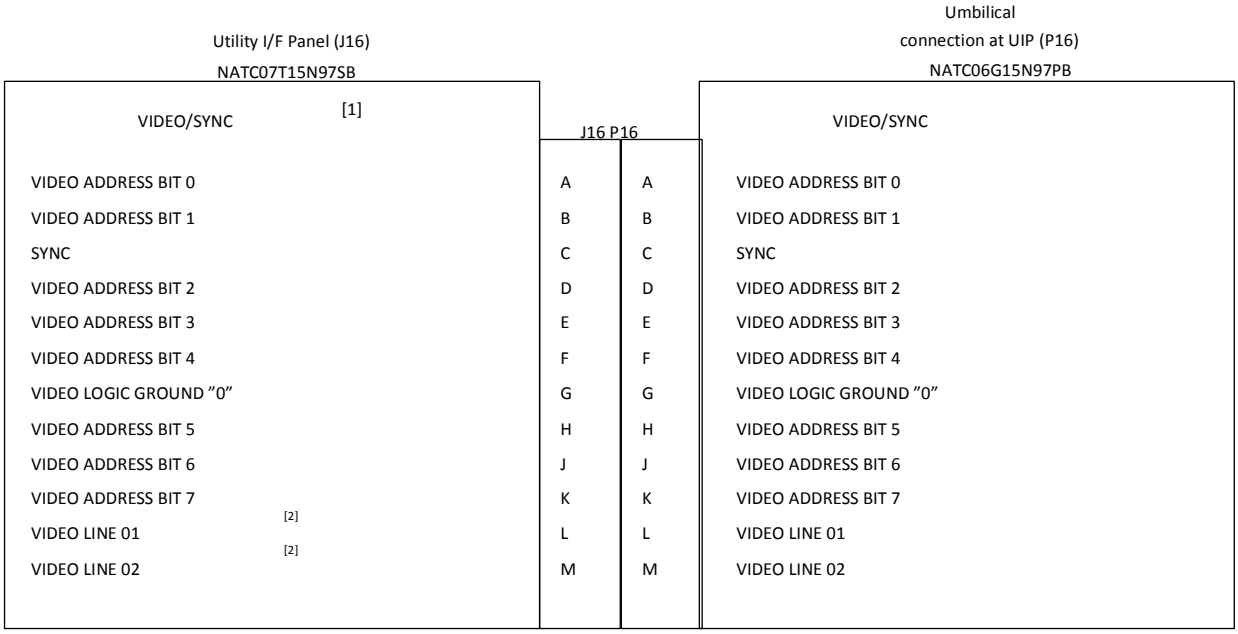


FIGURE 3.3.5.3–1 RACK MAINTENANCE SWITCH INTERFACE



NOTE [1]: Video address is ISPR Module location unique.

NOTE [2]: VIDEO LINE 01 for USL: Video into VSU
VIDEO LINE 02 for USL: Video from VSU

FIGURE 3.4.1.2–1 OPTICAL VIDEO CONNECTOR / PIN ASSIGNMENT – J16

3.4.2 NTSC ELECTRICAL VIDEO INTERFACES

The FIR does not utilize JEM interfaces; thus the electrical video interfaces do not apply.

3.5 THERMAL CONTROL INTERFACE REQUIREMENTS

3.5.1 INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS

3.5.1.1 CONNECTOR

The location of the ITCS Moderate Temperature Loop (MTL) interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The MTL connectors are defined in Table 3.1.2-1. The FIR does not utilize the Low Temperature Loop (LTL) interfaces.

3.5.1.2 ITCS COOLANT FLOW RATE AND PRESSURE DROP

The FIR can request to be supplied a specific flow rate within the ranges specified in Table 3.5.1.2-1. Multiple flow rate settings can be accommodated, provided the control system time constant requirements are met and the flow rate setting changes are properly coordinated with the Module Integrator. During nominal operations, the FIR should receive ITCS coolant from the interface at maximum flow. The FIR contains two ITCS flow control devices, the Water Flow Control Assembly (WFCA), used in conjunction with the ISS Rack Flow Control Assembly

(RFCA). Each WFCA is capable of controlling the flow of coolant through the FIR within the range of 25 to 500 ± 15 lbm/hr. A schematic of the FIR coolant loop is provided in Figure 3.5.1.2-1. The maximum pressure drop across the FIR for the MTL is defined in Figure 3.5.1.2-2. The coolant flow rate required by the FIR and the corresponding pressure drop across the rack is defined in Figure 3.5.1.2-3.

TABLE 3.5.1.2-1 ITCS SELECTABLE COOLANT FLOW RATES

Loop/Lab	System Control Capability	USL [1] lbm/hr (kg/hr)	FIR* lbm/hr (kg/hr)
MTL w/RFCA	±5% > 350 lb/hr ±10% ≤ 350 lb/hr	100 - 745 (45 - 339)	100-430 (45-196)

Note 1: The integrated rack return temperature design point will be greater than or equal to a delta T of 35 degrees F for the MTL.

*This condition represents an exception to requirements found in SSP 57000, paragraphs 3.5.1.6.A and 3.5.1.6.B. Refer to 57218-NA-0002A. Table 5.1-1 provides the status of all exceptions.

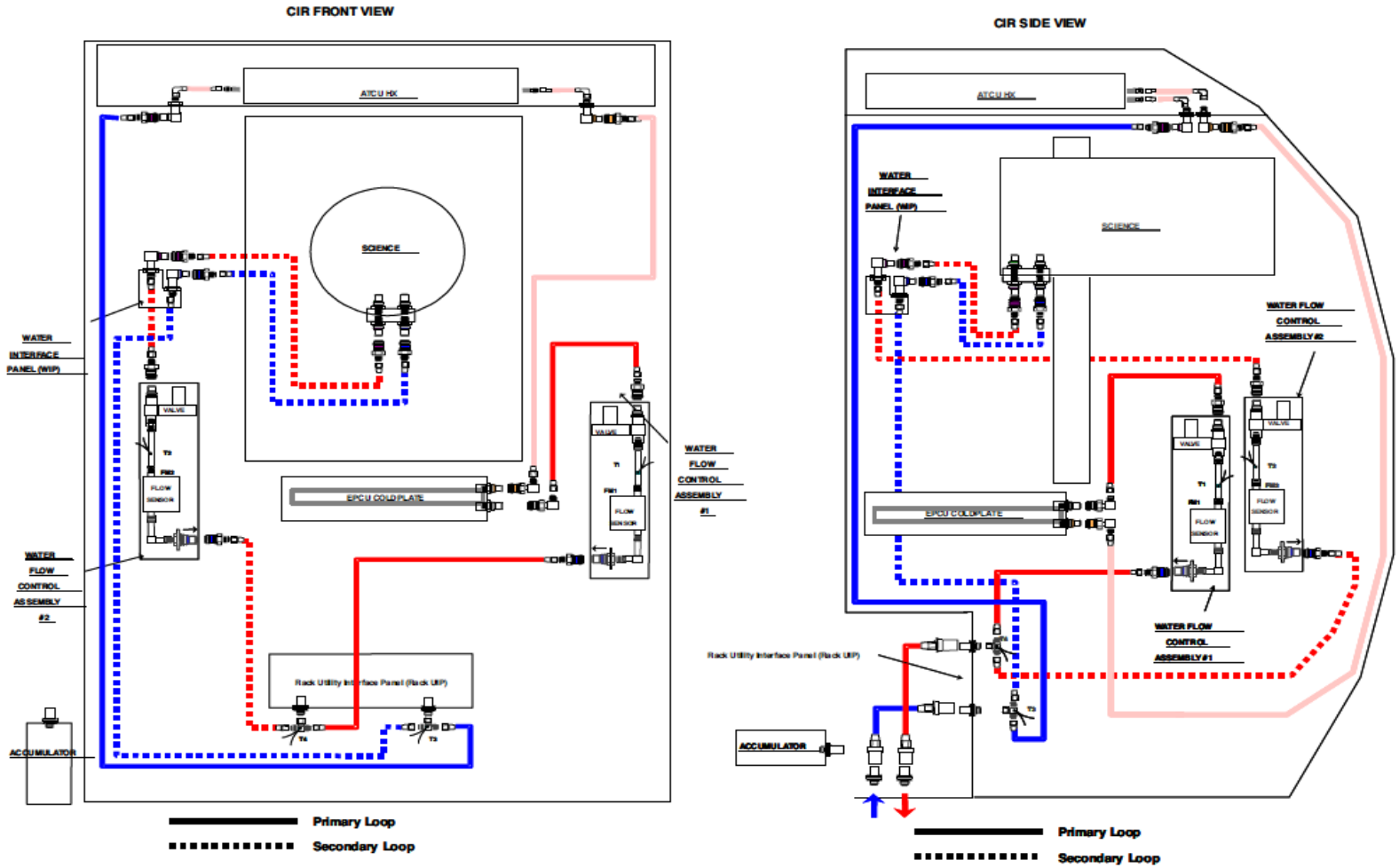


FIGURE 3.5.1.2–1 FIR FLUID LOOP SCHEMATIC

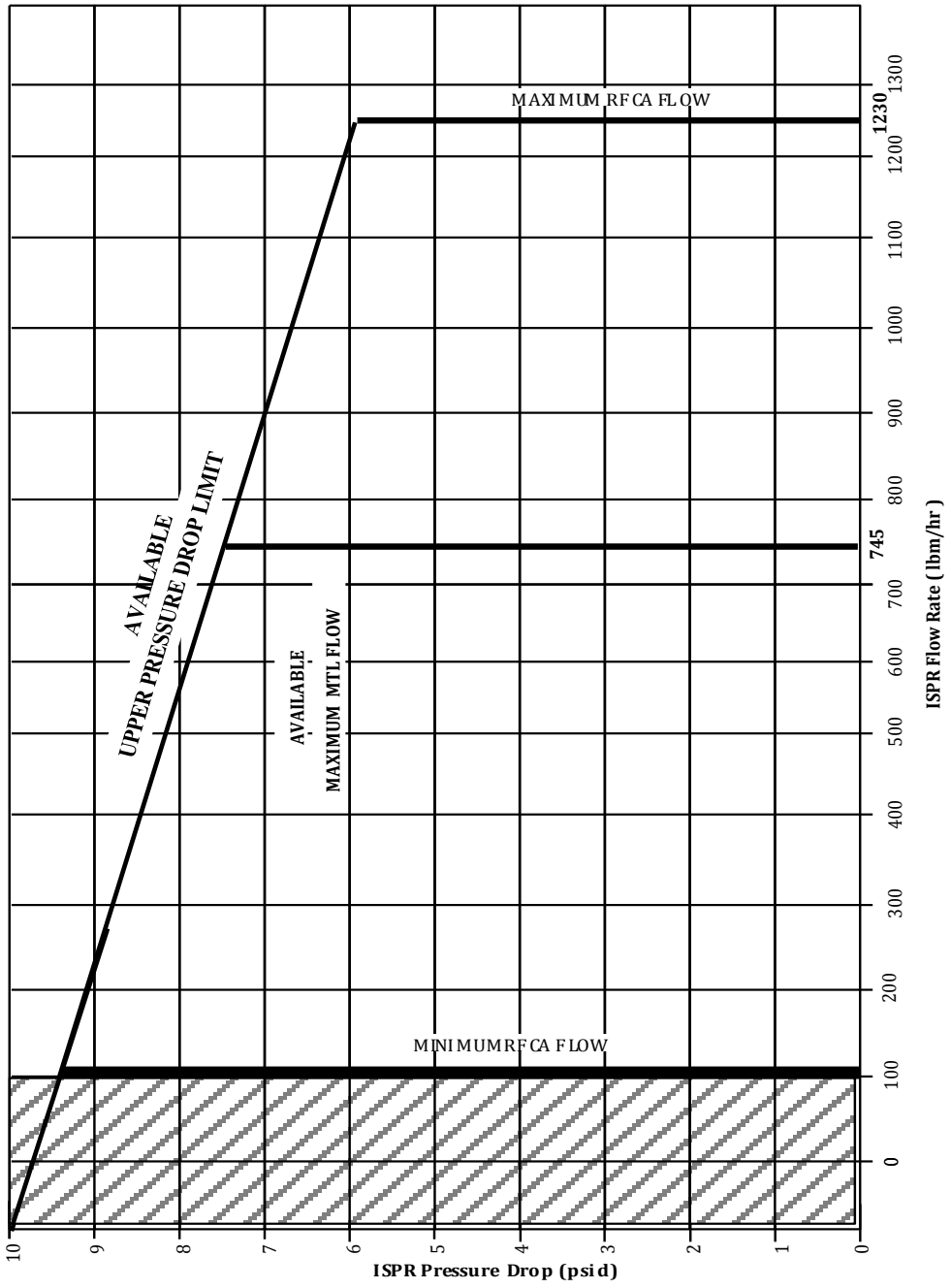
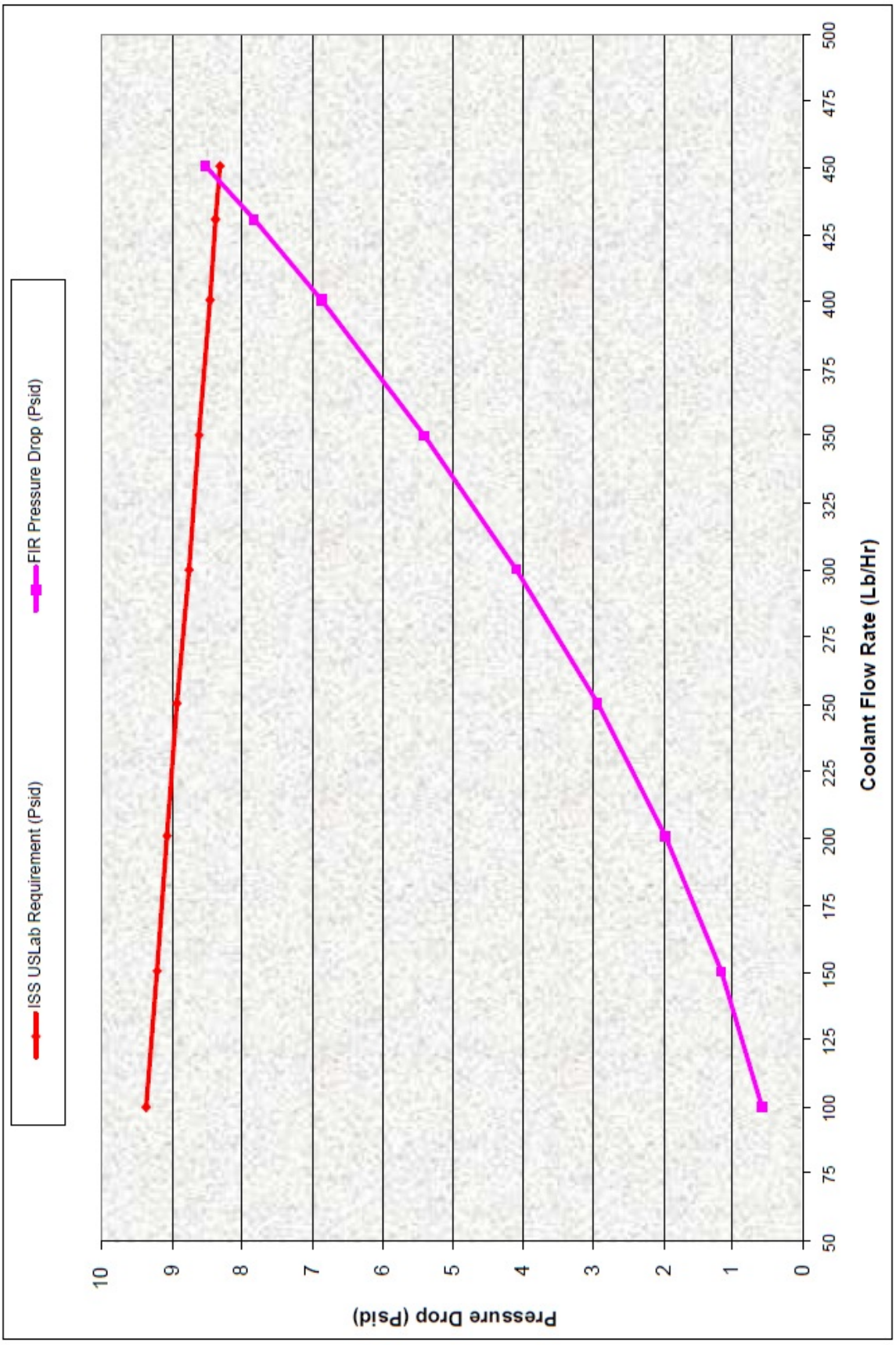


FIGURE 3.5.1.2-2 U.S. LAB AVAILABLE PRESSURE DROP VS. FLOW RATE


ISS USLab Requirement (Psid)
FIR Pressure Drop (Psid)
Pressure Drop (Psid)
Coolant Flow Rate (Lb/Hr)
0
1
2
3
4
5
6
7
8
9
10
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
500

3.5.1.3 COOLANT SUPPLY TEMPERATURE

The ITCS coolant loop supply temperatures in the USL MTL are 61°- 65°F (16°- 18.3°C).

The FIR does not utilize the MPLM coolant interfaces.

3.5.1.4 DELETED

3.5.1.5 SIMULTANEOUS COOLING

The FIR does not utilize the LTL coolant interface; thus simultaneous cooling will not be utilized.

3.5.1.6 INTEGRATED RACK COOLANT QUANTITY

The maximum total water volume available for payload use from the MTL in the USL is 42.25 gallons (159.9 liters). The quantity of coolant contained in the FIR is 1.8 gallons (6.6 liters).

3.5.1.7 INTEGRATED RACK FLUID THERMAL EXPANSION

The FIR will provide compensation for thermal expansion of the ITCS cooling fluid in its cooling system in accordance with SSP 57000, paragraph 3.5.1.2. A removable accumulator is identified in the FIR ITCS schematic shown in Figure 3.5.1.2-1. The accumulator protrusion interfaces are shown in Figure 3.1.1.1-1.

3.5.1.8 CABIN AIR HEAT LOADS

The total cabin air sensible heat load for each module is defined in Table 3.5.1.8-1. The FIR cabin air sensible heat load is provided in Table 3.5.1.8-1. The total cabin air latent heat load for each module is defined in Table 3.5.1.8-2. The FIR cabin air latent heat load is provided in Table 3.5.1.8-2.

TABLE 3.5.1.8-1 CABIN AIR SENSIBLE HEAT LOAD

USL Limit	Heat Transferred from the FIR to the Cabin Air
500 W	25 W

TABLE 3.5.1.8-2 CABIN AIR LATENT HEAT LOAD

USL Limit	FIR LOAD
70 W	0 W

3.5.1.9 MPLM CABIN AIR COOLING

The FIR does not operate in the MPLM.

3.6 VACUUM SYSTEM REQUIREMENTS

3.6.1 VACUUM EXHAUST SYSTEM (VES) / WASTE GAS SYSTEM (WGS)

The Vacuum Exhaust System / Waste Gas System (VES / WGS) is capable of reaching a pressure at the ISPR interface of 1 x 10^{-3} torr (0.13 Pa) in less than two hours for a single payload/facility volume of 100 liters at an initial pressure of 14.7 psia (101 kPa); dry air at 70°F (21°C) assuming zero leakage and out/offgassing and infinite conductivity between payload/facility volume and the rack interface. The ISPR locations in the USL providing VES / WGS capabilities are illustrated in Figure 3.6.1-1. The location of the VES / WGS interface at the UIP is defined in Figures 3.1.2-1 and 3.1.2-2. The VES / WGS connector is defined in Table 3.1.2-1.

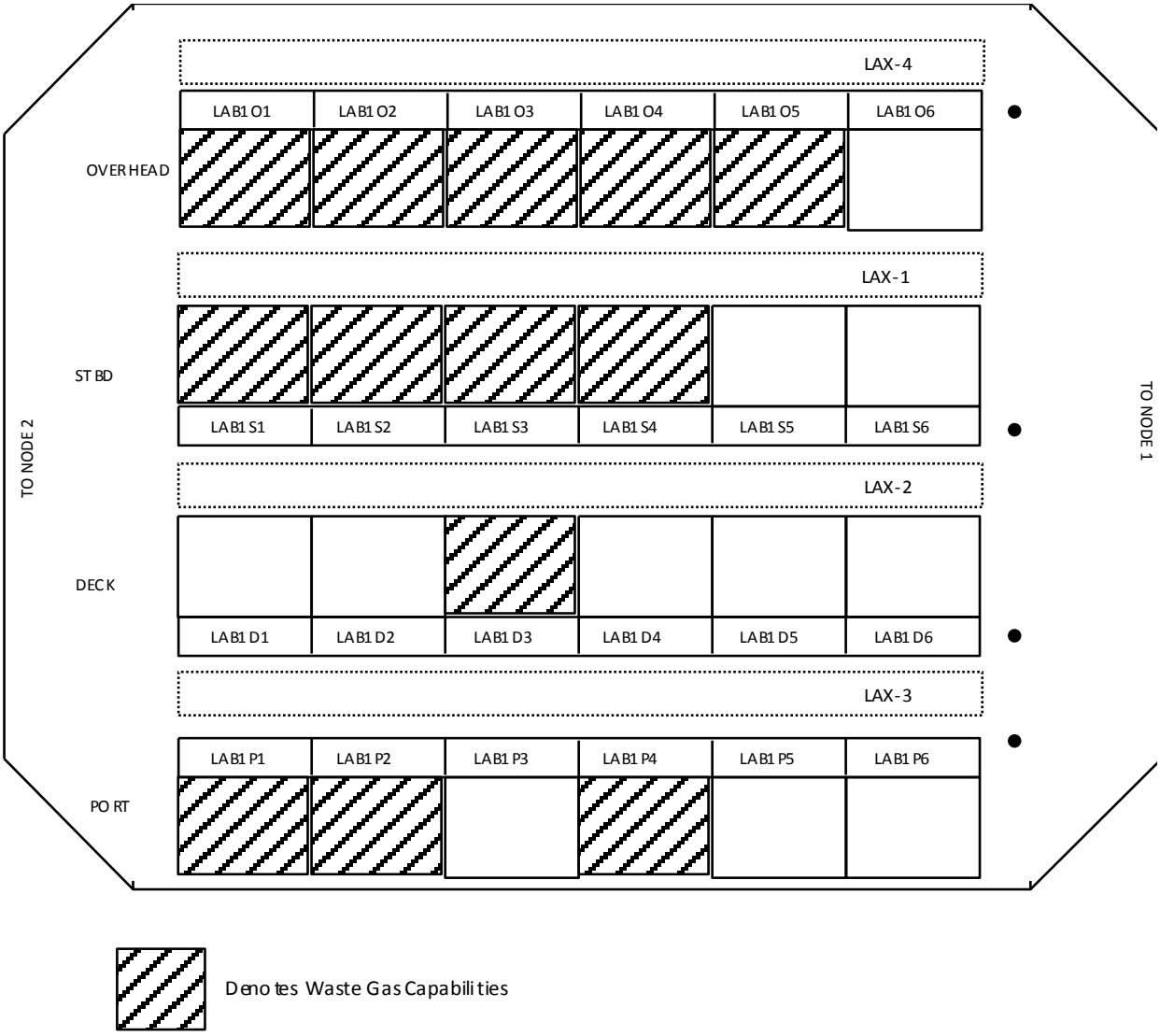


FIGURE 3.6.1–1 USL VES / WGS INTERFACE LOCATIONS

3.6.1.1 ACCEPTABLE EXHAUST GASES

A list of acceptable exhaust gases with verified compatibility to the VES wetted materials, as required by SSP 57000, paragraph 3.6.1.5.A, is documented in Table D-1 of SSP 57000. The proposed FIR vented gases that have been verified to be compatible with VES wetted materials are identified in Table 3.6.1.1-1. Further analysis in accordance with SSP 57000, paragraphs 3.6.1.5.B, 3.6.1.5.C, and 3.6.1.5.D must be approved prior to venting of the gases into the VES.

Contingency events are defined as unplanned uses of the VES to expel gases. VES will not be used for liquid or frangible cleanup. FIR will list constituents that will be exhausted after scrubbing and/or dilution for such an event. These gases must be compatible with the VES.

TABLE 3.6.1.1-1 FIR VENTED GASES

Constituent	Mass	Temperature	Total Pressure	Concentration (mg/m^3)
Pentane	1.13 mg	25_C	1 Atm	37.8 mg/m3 air
Ethanol	1.41 mg	25_C	1 Atm	47.3 mg/m3 air
Decalin	.00003 mg	25_C	1 Atm	0.0011 mg/m3 air
Tetralin	.00004 mg	25_C	1 Atm	0.0012 mg/m3 air
Water	.0001 mg	25_C	1 Atm	0.0034 mg/m3 air
Air	3.48 g	25_C	1 Atm	

The VES is used to pull a vacuum on the Aux Fluids Container (AFC) after the sample tray is inserted into the AFC. Gas will only be vented if during this leak test a sample was broken and it was not known.

If a break is known, the vacuum cleaner will be used to clean up liquid and frangible material, using filters to protect against release of liquid or hazardous gas to cabin.

A 10 micron filter will be used for the VES and a 0.3 micron filter will be used for the vacuum cleaner bag.

3.6.1.2 FIR INCOMPATIBLE GASES

The FIR will provide containment, storage, and transportation hardware for gases listed in Tables 3.6.1.2-1 and 3.6.1.2-2. The gases listed in Table 3.6.1.2-1, FIR Gases Incompatible with VES Wetted Materials, will not be vented to VES.

The FIR will be located only in the USL. All FIR gases to be vented overboard will be vented via the USL VES. Since the USL VES is two fault tolerant against contamination of the ISS atmosphere during the venting process, there is no constraint on the toxicity of gases which will be vented to that system.

TABLE 3.6.1.2-1 FIR GASES INCOMPATIBLE WITH VES WETTED MATERIALS

Constituent	Mass (kg)	Temperature °C
None		

TABLE 3.6.1.2-2 FIR INCOMPATIBLE GASES (VENT ONLY AFTER REMEDIATION)

Constituent	Mass (kg)	Temperature °C
None		

Gases in Table 3.6.1.2-2, FIR Incompatible Gases (Vent only after Remediation) will be diluted, filtered, or absorbed such that they meet the levels identified in Table 3.6.1.1-1 prior to venting.

3.6.2 VACUUM RESOURCE SYSTEM (VRS) / VACUUM VENT SYSTEM (VVS)

The Vacuum Resource System / Vacuum Vent System (VRS / VVS) in the USL has the capability to maintain a single payload facility volume at 0.13 Pa when the total gas load, including leakage and out / offgassing does not exceed 1.0×10^{-3} mbar-liter/sec assuming infinite conductance between payload facility volume and the ISPR interface. The location of the VRS / VVS interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The VRS / VVS connector is defined in Table 3.1.2-1. The ISPR locations which provide VRS / VVS capabilities are identified in Figure 3.6.2-1.

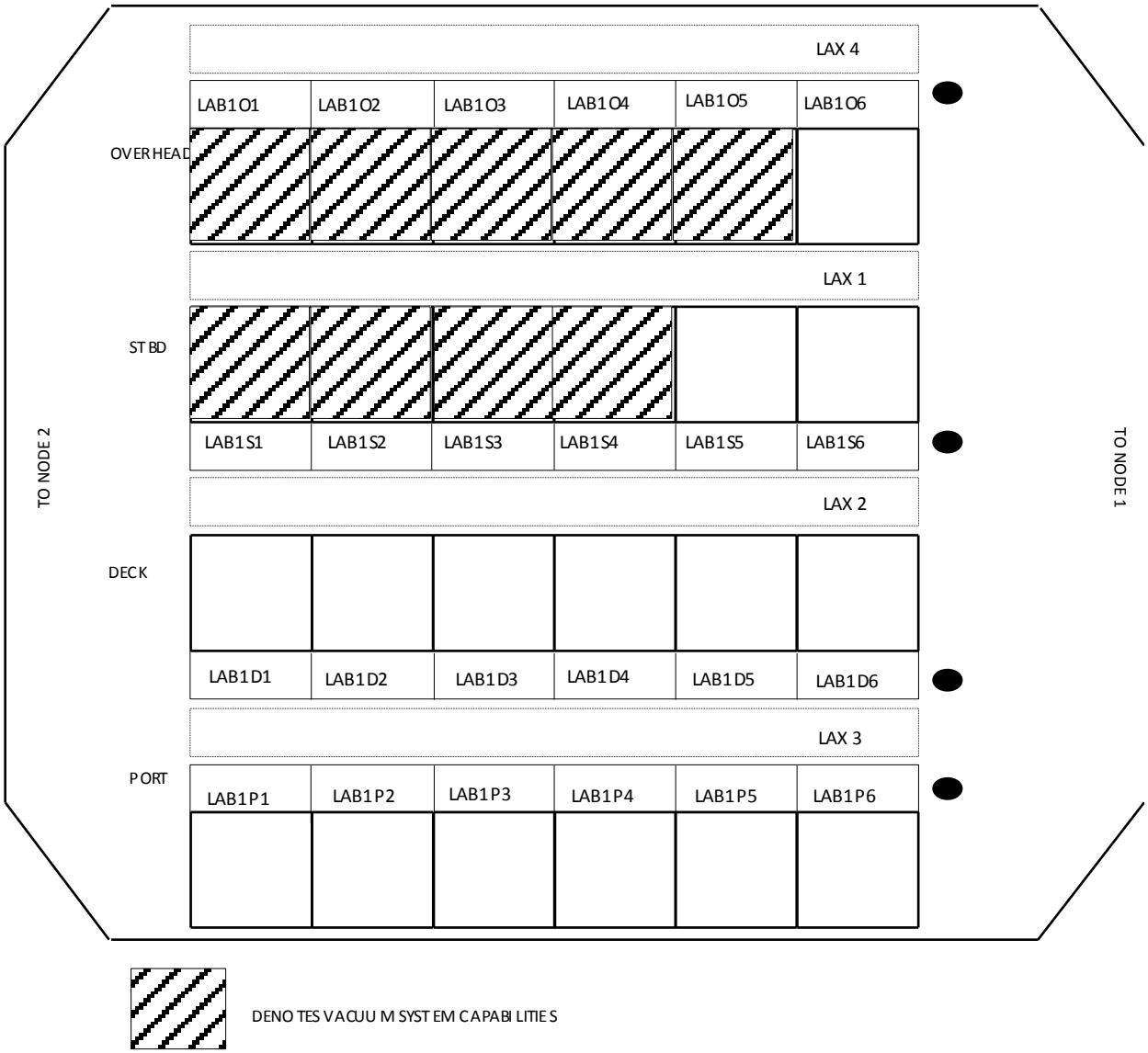


FIGURE 3.6.2–1 USL VRS / VVS INTERFACE LOCATIONS

3.6.2.1 ACCEPTABLE GASES

The only gases introduced by the FIR into the VRS will be the result of outgassing and leakage. This will include constituents identified in Table 3.6.1.1-1. The FIR will maintain pressure at the interface with the VRS at or below 1×10^{-3} torr.

3.7 PRESSURIZED GASES INTERFACE REQUIREMENTS

The ISS provides gaseous nitrogen (GN_2) to the FIR.

The location of the pressurized gas interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The pressurized gas connectors are defined in Table 3.1.2-1.

The physical and chemical properties of the provided gases are per SSP 30573, Space Station Program Fluid Procurement and Use Control Specification.

A schematic of the FIR pressurized system is provided in Figure 3.7-1.

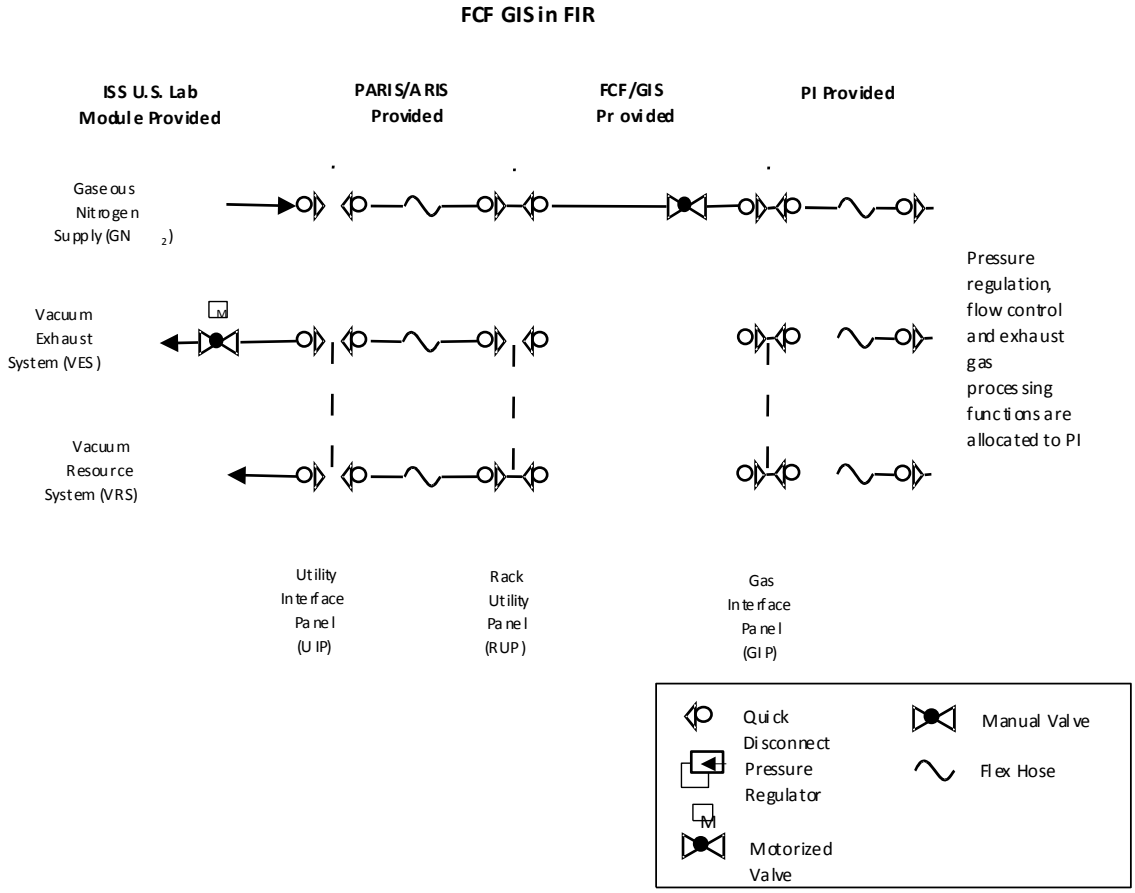


FIGURE 3.7-1 FIR PRESSURIZED GAS SCHEMATIC

3.8 PAYLOAD SUPPORT SERVICES INTERFACES REQUIREMENTS

3.8.1 POTABLE WATER INTERFACE

The FIR does not utilize the potable water interface.

3.8.2 FLUID SYSTEM SERVICER

The FSS can supply ITCS coolant water to, or remove it from, the FIR on orbit. The FSS interface connectors are defined in Table 3.1.2-1. The physical and chemical properties of the ITCS coolant water are per SSP 30573.

The FIR will utilize the FSS for each process identified in Table 3.8.2-1. The quantity of coolant required by the FIR from the FSS and the quantity of coolant returned to the FSS is defined in Table 3.8.2-1.

TABLE 3.8.2-1 FSS USAGE

Process	Quantity Required (gal)	Quantity Returned (gal)
Fluid Changeout	1.8	1.8

3.9 ENVIRONMENTAL INTERFACES

3.9.1 DELETED

3.9.1.1 DELETED

3.9.1.2 DELETED

3.9.1.3 DELETED

3.9.2 ACOUSTICS

3.9.2.1 CONTINUOUS NOISE

An integrated rack which operates for more than 8 hours in a 24 hour period and generates a Sound Pressure Level (SPL) greater than or equal to 37 dBA is classified as a Continuous Noise Source. An integrated rack which is classified as a Continuous Noise Source must either meet the limits defined in Table 3.9.2.1-1 or demonstrate that the cumulative time it generates noise above the limits defined in Table 3.9.2.1-1 during a 24 hour period meets the Intermittent Noise Limits defined in Paragraph 3.9.2.2.

The FIR Continuous Noise characteristics are defined in Table 3.9.2.1-1.

TABLE 3.9.2.1-1 CONTINUOUS NOISE

Overall A-Weighted SPL (dBA)		
Frequency Band (Hz)	Integrated Rack SPL (dB) Limit	FIR Continuous SPL (dB)
63	64	52.4
125	56	49.3
250	50	51.3*
500	45	45.4*
1000	41	39.1
2000	39	34.4
4000	38	30.1
8000	37	26.6

Note: The integrated rack SPL is to be measured at a distance of 0.6 meters from the test article.
* This value represents an exception condition. Refer to 57218-NA-0017A.

3.9.2.2 INTERMITTENT NOISE

An integrated rack which operates for less than 8 hours in a 24 hour period and generates a SPL greater than or equal to 37 dBA measured at a distance of 0.6 meters from the noisiest part of the rack is classified as an Intermittent Noise Source. FIR Intermittent Values have a negligible impact to the approved continuous noise levels. FIR has been approved for continuous operations.

3.9.3 HUMIDITY INTERFACE

Equipment within the FIR does not condense humidity from the cabin atmosphere.

3.9.4 ACTIVE AIR EXCHANGE

Cabin air may be used for ventilation but may not be used for cooling of payload equipment mounted in the FIR.

The FIR does not utilize processes that involve active air exchange with cabin atmosphere.

4.0 APPLICABILITY MATRIX

4.1 PURPOSE

The purpose of this payload unique ICD is to define and control the design of interfaces and verification requirements between the ISS and the FCF / FIR. The integrated rack or payload interfaces and verification requirements are defined by direct reference to the corresponding sections and subsections of the Pressurized Payload Interface Requirements Document (IRD), SSP 57000. The Payload Developer and the ISS Payloads Office must mutually disposition each IRD paragraph and record that disposition in the Applicability / Verification matrix. The documented Applicability / Verification matrix for FIR also serves as the verification requirements matrix for FIR.

4.2 ORGANIZATION

Figure 4.2-1 defines the information that is addressed by each column in Table 4.2-1. In the Applicability/Verification Matrix, Table 4.2-1, the numbers and headings are referenced to the corresponding section and subsection of the IRD. Shaded entries are included for reference only, and are not required to be dispositioned.

IRD Paragraph	IRD Requirement	Payload Applicability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
Block A	Block B	Block C	Block D	Block E	Block F	Block G	Block H

- Block A - Contains the SSP 57000 Section 3 and Section 4 requirement numbers.
- Block B - Contains the SSP 57000 Section 3 requirement title.
- Block C - Each paragraph of the IRD shall be dispositioned in the "Payload Applicability" column with one of the following:

  A Applicable to this ICD, indicating that the referenced interface is utilized by the integrated rack facility or payload hardware item.

  N/A Not Applicable to this ICD, indicating that the referenced interface is not utilized by the integrated rack facility or payload hardware item. Rationale is required for each requirement listed as N/A. (See Block H.)

  E Exception for this requirement has been submitted and is listed in the "Exceptions" table.

- Block D - Contains the SSP 57000 Section 4 verification method. Also contains title, NVR, and Safety for requirements the PSRP.
- Block E - Contains the data submittal that is required by OZ3.
- Block F - Contains the date the submittal data is required by OZ3. (In Launch minus (L-) month format.)
- Block G - Identifies the verification method used to address the requirement when a subrack payload is changed out within a rack that remains on-orbit
- Block H - Used for any relevant comments that need to be added, including information regarding deviation from template methodology and rationale explaining any requirements listed as N/A.

FIGURE 4.2-1 EXAMPLE APPLICABILITY / VERIFICATION MATRIX

When completing Table 4.2-1, Applicability/Verification Matrix, IRD Paragraphs which are "N/A" should be so indicated in the Payload Applicability column. Information in the Method, Required Submittal Data, Submittal Date, Subrack PL Changeout Verification, and Comments columns should remain. These blocks should be grayed to indicate the requirements is N/A. If any preexisting information within Table 4.2-1 is modified, the modification must be noted in the Comments column, along with a justification for change.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 0 / 4. 3. 0	PAYLOAD INTERFACE REQUIREMENTS AND GUIDANCE		TITLE	N/A	N/A	N/A	
3. 1 / 4. 3. 1	STRUCTURAL/MECHANICAL, MICROGRAVITY, AND STOWAGE INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 1. 1 / 4. 3. 1. 1	STRUCTURAL/MECHANICAL		TITLE	N/A	N/A	N/A	
3. 1. 1. 1. A / 4. 3. 1. 1. 1. A	GSE Interfaces	E	I	Certificate of Compliance.	L-3.5	N/A	57217-NA-0035A
3. 1. 1. 1. B / 4. 3. 1. 1. 1. B	GSE Interfaces	A	D	Certificate of Compliance.	L-3.5	N/A	
3. 1. 1. 1. C / 4. 3. 1. 1. 1. C	GSE Interfaces	A	D	Certificate of Compliance.	L-3.5	N/A	
3. 1. 1. 1. D / 4. 3. 1. 1. 1. D	GSE Interfaces	A	T&A	Certificate of Compliance.	L-3.5	N/A	
3. 1. 1. 2. A / 4. 3. 1. 1. 2. A	MPLM Interfaces	A	I	Certificate of Compliance.	L-3.5	N/A[1]	
3. 1. 1. 2. B / 4. 3. 1. 1. 2. B	MPLM Interfaces	A	A	Certificate of Compliance.	L-3.5	A	
3. 1. 1. 2. C / 4. 3. 1. 1. 2. C	DELETED		N/A	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 2. D / 4. 3. 1. 1. 2. D	DELETED		N/A	N/A	N/A	N/A	
3. 1. 1. 2. E / 4. 3. 1. 1. 2. E	MPLM Interfaces	A	A	1. Data Cert, based on static analysis using approved FEM (or DCL analysis results), providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3. 2. Data Cert providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3.	2. L-7.5 2. L-5	A	
3. 1. 1. 2. 1 / 4. 3. 1. 1. 2. 1	MPLM Late/Early Access Requirements	A	T	Certificate of Compliance.	L-3.5	T	
3. 1. 1. 2. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. A	MPLM Late Access Envelope (KSC)	A	I	Certificate of Compliance.	L-3.5	I	
3. 1. 1. 2. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. B	MPLM Late Access Envelope (KSC)	A	I	Certificate of Compliance.	L-3.5	I	
3. 1. 1. 2. 1. 1. C / 4. 3. 1. 1. 2. 1. 1. C	MPLM Late Access Envelope (KSC)	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 2. 1. 2. A / 4. 3. 1. 1. 2. 1. 2. A	MPLM Early Access Envelopes (KSC and DFRC)	A	I	Certificate of Compliance.	L-3.5	I	
3. 1. 1. 2. 1. 2. B / 4. 3. 1. 1. 2. 1. 2. B	MPLM Early Access Envelopes (KSC and DFRC)	A	I	Certificate of Compliance.	L-3.5	I	
3. 1. 1. 3. A / 4. 3. 1. 1. 3. A	Loads Requirements	A	A	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L-7.5 2. L-5	A	
3. 1. 1. 3. B / 4. 3. 1. 1. 3. B	Loads Requirements	A	A	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L-7.5 2. L-5	A	
3. 1. 1. 3. C / 4. 3. 1. 1. 3. C	Loads Requirements	A	I	Certificate of Compliance.	L-3.5	N/A	

**TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)**

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 3. D / 4. 3. 1. 1. 3. D	Loads Requirements	E	A	Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1 showing positive margins of safety	L-7.5	A	57218-NA-0014 57218-NA-0010 57217-NA-0036B
3. 1. 1. 3. E / 4. 3. 1. 1. 3. E	Loads Requirements	A	A	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L-7.5 2. L-5	A	
3. 1. 1. 3. F / 4. 3. 1. 1. 3. F	Loads Requirements	A	A	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L-7.5 2. L-5	A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 4. A / 4. 3. 1. 1. 4. A	Rack Requirements	E	D&A	Data Cert providing weight and cg summaries for launch and landing of the integrated rack.	L-7	T&A	57227-NA-0008 57218-NA-0008
3. 1. 1. 4. B / 4. 3. 1. 1. 4. B	Rack Requirements	A	A	Certificate of Compliance.	L-3.5	A	
3. 1. 1. 4. C / 4. 3. 1. 1. 4. C	Rack Requirements	A	A	Certificate of Compliance	L-5	A	
3. 1. 1. 4. D / 4. 3. 1. 1. 4. D	Rack Requirements		NVR	N/A	N/A	N/A	
3. 1. 1. 4. E / 4. 3. 1. 1. 4. E	Rack Requirements	E	I	Certificate of Compliance.	L-3.5	I	57217-NA-0039
3. 1. 1. 4. F / 4. 3. 1. 1. 4. F	Rack Requirements	N/A	A	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the lab window rack location
3. 1. 1. 4. G / 4. 3. 1. 1. 4. G	DELETED		N/A	N/A	N/A	N/A	
3. 1. 1. 4. H / 4. 3. 1. 1. 4. H	DELETED		N/A	N/A	N/A	N/A	
3. 1. 1. 4. I / 4. 3. 1. 1. 4. I	Rack Requirements	A	A	Certificate of Compliance.	L-3.5	A	
3. 1. 1. 4. J / 4. 3. 1. 1. 4. J	DELETED		N/A	N/A	N/A	N/A	
3. 1. 1. 4. K / 4. 3. 1. 1. 4. K	Rack Requirements	A	A	Certificate of Compliance.	L-3.5	A	
3. 1. 1. 4. L / 4. 3. 1. 1. 4. L	Rack Requirements	A	A	Certificate of Compliance.	L-3.5	A	
3. 1. 1. 4. M / 4. 3. 1. 1. 4. M	Rack Requirements	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 4. N / 4. 3. 1. 1. 4. N	Rack Requirements	A	A	Certificate of Compliance	L-3.5	N/A	
3. 1. 1. 4. O / 4. 3. 1. 1. 4. O	Rack Requirements	A	A	Certificate of Compliance	L-3.5	N/A	
3. 1. 1. 4. P / 4. 3. 1. 1. 4. P	Rack Requirements	N/A	A	Certificate of Compliance	L-3.5	A	This requirement does not apply to ARIS racks.
3. 1. 1. 4. Q / 4. 3. 1. 1. 4. Q	Rack Requirements	N/A	A	Certificate of Compliance	L-3.5	N/A	FIR does not have a pressure relief device on the front of the rack.
3. 1. 1. 4. R / 4. 3. 1. 1. 4. R	Rack Requirements	A	I	Certificate of Compliance	L-3.5	N/A	
3. 1. 1. 4. S / 4. 3. 1. 1. 4. S	Rack Requirements	N/A	I or A&I	Certificate of Compliance	L-3.5	N/A	FIR will not be installed in the JEM
3. 1. 1. 4. 1. A / 4. 3. 1. 1. 4. 1. A	Lab Window Rack Location Requirements	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize the lab window rack location
3. 1. 1. 4. 1. B / 4. 3. 1. 1. 4. 1. B	Lab Window Rack Location Requirements	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not utilize the lab window rack location
3. 1. 1. 4. 1. C / 4. 3. 1. 1. 4. 1. C	Lab Window Rack Location Requirements	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize the lab window rack location
3. 1. 1. 4. 1. D / 4. 3. 1. 1. 4. 1. D	Lab Window Rack Location Requirements	N/A	I	Certificate of Compliance	L-3.5	A	No hand-held items

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 5 / 4. 3. 1. 1. 5	Safety Critical Structures Requirements	A	Per SSP 52005[1]	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L-7.5 2. L-5	A	
3. 1. 1. 6 / 4. 3. 1. 1. 6	CONNECTOR AND UMBILICAL PHYSICAL MATE		TITLE	N/A	N/A	N/A	
3. 1. 1. 6. 1 / 4. 3. 1. 1. 6. 1	Connector Physical Mate	A	D	Certificate of Compliance.	L-3.5	D	
3. 1. 1. 6. 2 / 4. 3. 1. 1. 6. 2	Umbilical Physical Mate	A	D	Certificate of Compliance.	L-3.5	N/A	
3. 1. 1. 7. A / 4. 3. 1. 1. 7. A	On-Orbit Payload Protrusions	E	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	57217-NA-0029B
3. 1. 1. 7. B / 4. 3. 1. 1. 7. B	On-Orbit Payload Protrusions	A	A	Certificate of Compliance	L-3.5	D or A	
3. 1. 1. 7. 1 / 4. 3. 1. 1. 7. 1	On-Orbit Permanent Protrusions	E	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	57217-NA-0033

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 1. 7. 2. A / 4. 3. 1. 1. 7. 2. A	On-Orbit Semi-Permanent Protrusions	A	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	
3. 1. 1. 7. 2. B / 4. 3. 1. 1. 7. 2. B	On-Orbit Semi-Permanent Protrusions	A	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	
3. 1. 1. 7. 2. C / 4. 3. 1. 1. 7. 2. C	On-Orbit Semi-Permanent Protrusions	A	D	Certificate of Compliance	L-3.5	D	
3. 1. 1. 7. 3. A / 4. 3. 1. 1. 7. 3. A	On-Orbit Temporary Protrusions	E	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	57218-NA-0001B 57218-NA-0019A 57218-NA-0031A
3. 1. 1. 7. 3. B / 4. 3. 1. 1. 7. 3. B	On-Orbit Temporary Protrusions	A	D	Certificate of Compliance	L-3.5	D	
3. 1. 1. 7. 4 / 4. 3. 1. 1. 7. 4	On-Orbit Momentary Protrusions	A	D	Certificate of Compliance	L-3.5	D	
3. 1. 1. 7. 5/ 4. 3. 1. 1. 7. 5	On-Orbit Protrusions for Keep-Alive Payloads	N/A	I	Data Cert providing drawings identifying all protrusions.	L-7.5	I	The FIR is not a keep-alive payload
3. 1. 2 / 4. 3. 1. 2	MICROGRAVITY		NVR	N/A	N/A	N/A	
3. 1. 2. 1 / 4. 3. 1. 2. 1	Quasi-Steady Requirements	A	A	Analysis Report	L-7.5	A	
3. 1. 2. 2 / 4. 3. 1. 2. 2	Vibratory Requirements/ Mechanical Vibration	A	A	Analysis or Test Report	L-7.5	A or T&A	
3. 1. 2. 3. A / 4. 3. 1. 2. 3. A	Transient Requirements	A	A	Analysis or Test Report	L-7.5	A or T&A	
3. 1. 2. 3. B / 4. 3. 1. 2. 3. B	Transient Requirements	A	A	Analysis or Test Report	L-7.5	A or T&A	
3. 1. 2. 4 / 4. 3. 1. 2. 4	Microgravity Environment		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 1. 2. 5 / 4. 3. 1. 2. 5	ARIS Rack Vibratory Requirement/ARIS On-Board to Off-Board Vibratory Requirement	A	A	Analysis or Test Report	L-7.5	A or T&A	
3. 1. 2. 6 / 4. 3. 1. 2. 6	Angular Momentum Limits		NVR	N/A	N/A	N/A	
3. 1. 2. 6. 1 / 4. 3. 1. 2. 6. 1	Limit Disturbance Induced ISS Attitude Rate	A	A	Analysis Report	L-7.5	A	
3. 1. 2. 6. 2 / 4. 3. 1. 2. 6. 2	Limit Disturbance Induced CMG Momentum Usage	A	A	Analysis Report	L-7.5	A	
3. 1. 3 / 4. 3. 1. 3	Stowage		NVR	N/A	N/A	N/A	
3. 2 / 4. 3. 2	ELECTRICAL INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 2. 1 / 4. 3. 2. 1	Electrical Power Characteristics		NVR	N/A	N/A	N/A	
3. 2. 1. 1 / 4. 3. 2. 1. 1	STEADY-STATE VOLTAGE CHARACTERISTICS		TITLE	N/A	N/A	N/A	
3. 2. 1. 1. 1 / 4. 3. 2. 1. 1. 1	Interface B	A	T	Certificate of Compliance.	L-3.5	T&A	
3. 2. 1. 1. 2 / 4. 3. 2. 1. 1. 2	Interface C	N/A	T	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize Interface C
3. 2. 1. 2 / 4. 3. 2. 1. 2	RIPPLE VOLTAGE CHARACTERISTICS		TITLE	N/A	N/A	N/A	
3. 2. 1. 2. 1 / 4. 3. 2. 1. 2. 1	Ripple Voltage and Noise	A	T & A	Certificate of Compliance.	L-3.5	A	
3. 2. 1. 2. 2 / 4. 3. 2. 1. 2. 2	Ripple Voltage Spectrum	A	A	Certificate of Compliance.	L-3.5	T&A	
3. 2. 1. 3 / 4. 3. 2. 1. 3	TRANSIENT VOLTAGES		TITLE	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 1. 3. 1 / 4. 3. 2. 1. 3. 1	Interface B	A	T & A	Certificate of Compliance.	L-3.5	N/A	
3. 2. 1. 3. 2 / 4. 3. 2. 1. 3. 2	Interface C	N/A	N/A	Certificate of Compliance.	L-3.5	A or T	The FIR does not utilize Interface C.
3. 2. 1. 3. 3 / 4. 3. 2. 1. 3. 3	Fault Clearing and Protection	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 1. 3. 4. A / 4. 3. 2. 1. 3. 4. A	Non-Normal Voltage Range	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 1. 3. 4. B / 4. 3. 2. 1. 3. 4. B	Non-Normal Voltage Range	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 2 / 4. 3. 2. 2	ELECTRICAL POWER INTERFACE		TITLE	N/A	N/A	N/A	
3. 2. 2. 1. A / 4. 3. 2. 2. 1. A	UIP, UOP, and SUP Connectors and Pin Assignments		NVR	N/A	N/A	N/A	
3. 2. 2. 1. B / 4. 3. 2. 2. 1. B	UIP, UOP, and SUP Connectors and Pin Assignments	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 2. 2. 1. C / 4. 3. 2. 2. 1. C	UIP, UOP, and SUP Connectors and Pin Assignments	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 2. 2. 1. D / 4. 3. 2. 2. 1. D	UIP, UOP, and SUP Connectors and Pin Assignments		NVR	N/A	N/A	N/A	
3. 2. 2. 1. E / 4. 3. 2. 2. 1. E	UIP, UOP, and SUP Connectors and Pin Assignments	N/A	I	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the UOP
3. 2. 2. 1. F / 4. 3. 2. 2. 1. F	UIP, UOP, and SUP Connectors and Pin Assignments	N/A	I	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the UOP
3. 2. 2. 1. G / 4. 3. 2. 2. 1. G	UIP, UOP, and SUP Connectors and Pin Assignments		NVR	N/A	N/A	N/A	
3. 2. 2. 1. H / 4. 3. 2. 2. 1. H	UIP, UOP, and SUP Connectors and Pin Assignments	N/A	I	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the SUP
3. 2. 2. 1. I / 4. 3. 2. 2. 1. I	UIP, UOP, and SUP Connectors and Pin Assignments	N/A	I	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the SUP

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 2. 2. A / 4. 3. 2. 2. 2. A	Power Bus Isolation	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 2. 2. B / 4. 3. 2. 2. 2. B	Power Bus Isolation	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 2. 3 / 4. 3. 2. 2. 3	Compatibility With Soft Start/Stop RPC	A	T	Certificate of Compliance.	L-3.5	T&A	
3. 2. 2. 4 / 4. 3. 2. 2. 4	Surge Current	E	T&A	1. Analysis report including surge current profiles for common integrated rack configurations. 2. Test report.	1. L-7.5 2. L-7.5	T&A	57218-NA-0020A
3. 2. 2. 5 / 4. 3. 2. 2. 5	Reverse Energy/Current		NVR	N/A	N/A	N/A	
3. 2. 2. 5. 1 / 4. 3. 2. 2. 5. 1	Reverse Current Limits	A	A	Analysis Report (Description of model, parameters and the results of Analysis)	L-7.5	A	
3. 2. 2. 5. 2 / 4. 3. 2. 2. 5. 2	Transients Partially Contained Within The Envelope	A	A	Analysis Report (Description of model, parameters and the results of Analysis)	L-7.5	A	
3. 2. 2. 6 / 4. 3. 2. 2. 6	CIRCUIT PROTECTION DEVICES		TITLE	N/A	N/A	N/A	
3. 2. 2. 6. 1 / 4. 3. 2. 2. 6. 1	ISS EPS CIRCUIT PROTECTION CHARACTERISTICS		TITLE	N/A	N/A	N/A	
3. 2. 2. 6. 1. 1. A / 4. 3. 2. 2. 6. 1. 1. A	Remote Power Controllers (RPCs)	A	T	Test data	L-7.5	A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 2. 6. 1. 1. B / 4. 3. 2. 2. 6. 1. 1. B	Remote Power Controllers (RPCs)	N/A	T	Test data	L-7.5	N/A	The FIR is not powered while in the MPLM
3. 2. 2. 6. 1. 1. C / 4. 3. 2. 2. 6. 1. 1. C	Remote Power Controllers (RPCs)	N/A	T	Test data	L-7.5	A	The FIR does not utilize the UOP
3. 2. 2. 6. 1. 1. D / 4. 3. 2. 2. 6. 1. 1. D	Remote Power Controllers (RPCs)	A	A	Analysis data.	L-7.5	A	
3. 2. 2. 6. 1. 1. E / 4. 3. 2. 2. 6. 1. 1. E	Remote Power Controllers (RPCs)	A	A	Analysis data.	L-7.5	A	
3. 2. 2. 6. 1. 1. F / 4. 3. 2. 2. 6. 1. 1. F	Remote Power Controllers (RPCs)	N/A	T	Test report showing compliance with the requirement.	L-7.5	N/A	FIR is not manifested in COLUMBUS
3. 2. 2. 6. 2 / 4. 3. 2. 2. 6. 2	EPCE RPC INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 2. 2. 6. 2. 1 / 4. 3. 2. 2. 6. 2. 1	RPC TRIP COORDINATION		TITLE	N/A	N/A	N/A	
3. 2. 2. 6. 2. 1. 1 / 4. 3. 2. 2. 6. 2. 1. 1	Payload Trip Rating	E	T & D	Analysis Data	L-7.5	A	57217-NA-0045
3. 2. 2. 7 / 4. 3. 2. 2. 7	EPCE COMPLEX LOAD IMPEDANCES		TITLE	N/A	N/A	N/A	
3. 2. 2. 7. 1. A / 4. 3. 2. 2. 7. 1. A	Interface B	A	T	Test report showing compliance with the Unique Payload Hardware ICD.	L-7.5	T&A	
3. 2. 2. 7. 1. B / 4. 3. 2. 2. 7. 1. B	Interface B	A	T	Test report showing compliance with the Unique Payload Hardware ICD.	L-7.5	T&A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 2. 7. 2 / 4. 3. 2. 2. 7. 2	Interface C	N/A	T	Test report showing compliance with the Unique Payload Hardware ICD.	L-7.5	N/A	The FIR does not utilize Interface C
3. 2. 2. 8 / 4. 3. 2. 2. 8	Large Signal Stability	E	T&A	Analysis and test data for each integrated rack and EPCE.	L-7.5	T&A	57217-NA-0009
3. 2. 2. 9 / 4. 3. 2. 2. 9	DELETED		N/A	N/A	N/A	N/A	
3. 2. 2.10. A / 4. 3. 2. 2.10. A	Electrical Load-Stand Alone Stability	A	A	Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required.	L-7.5	T&A	
3. 2. 2.10. B / 4. 3. 2. 2.10. B	Electrical Load-Stand Alone Stability	A	A	Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required.	L-7.5	T&A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 2.10. C / 4. 3. 2. 2.10. C	Electrical Load-Stand Alone Stability	A	T & A	Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required.	L-7.5	A	
3. 2. 2.11 / 4. 3. 2. 2.11	DELETED		N/A	N/A	N/A	N/A	
3. 2. 2.12 / 4. 3. 2. 2.12	Maximum Load Step Size	A	T	Certificate of Compliance.	L-3.5	A	
3. 2. 2. 13 / 4. 3. 2. 2. 13	SUP GFI AC Characteristics		NVR	N/A	N/A	N/A	
3. 2. 2. 13 .1 / 4. 3. 2. 2. 13.1	Common Mode Capacitance	N/A	A	Analysis showing compliance with the requirement	L-7.5	N/A	FIR is not manifested in COLUMBUS
3. 2. 2. 13. 2 / 4. 3. 2. 2. 13. 2	Leakage Currents		NVR	N/A	N/A	N/A	
3. 2. 2. 13. 2. 1 / 4. 3. 2. 2. 13. 2. 1	Frequency Domain Leakage Limits	N/A	T	Test report showing compliance with the requirement	L-7.5	N/A	FIR is not manifested in COLUMBUS
3. 2. 2. 13. 2. 2 / 4. 3. 2. 2. 13. 2. 2	Time Domain Leakage Limits	N/A	T	Test report showing compliance with the requirement	L-7.5	N/A	FIR is not manifested in COLUMBUS
3. 2. 2. 14 / 4. 3. 2. 2. 14	Columbus Module □Power Off" Residual Voltage Level	N/A	T or I	Certificate of Compliance	L-3.5	N/A	FIR is not manifested in COLUMBUS

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 2. 15 / 4. 3. 2. 2. 15	JEM □Power Off" Residual Voltage Level	N/A	T or I	Certificate of Compliance	L-3.5	N/A	FIR is not manifested in JEM
3. 2. 3 / 4. 3. 2. 3	ELECTRICAL POWER CONSUMER CONSTRAINTS		TITLE	N/A	N/A	N/A	
3. 2. 3. 1. A / 4. 3. 2. 3. 1. A	Wire Derating	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize the UOP
3. 2. 3. 1. B / 4. 3. 2. 3. 1. B	Wire Derating	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 3. 1. C / 4. 3. 2. 3. 1. C	Wire Derating	E	I	Certificate of Compliance.	L-3.5	A	57217-NA-0027 57202-NA-0017A
3. 2. 3. 2. A / 4. 3. 2. 3. 2. A	Exclusive Power Feeds	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 3. 2. B / 4. 3. 2. 3. 2. B	Exclusive Power Feeds	A	A	Certificate of Compliance.	L-3.5	A	
3. 2. 3. 3 / 4. 3. 2. 3. 3	Loss of Power	A	Safety[2]	Certificate of Compliance.	L-3.5	A	
3. 2. 4 / 4. 3. 2. 4	Electromagnetic Compatibility	A	T&A&I	1. Test Report 2. Analysis Report	1. L-7.5 2. L-7.5	N/A	
3. 2. 4. 1 / 4. 3. 2. 4. 1	Electrical Grounding	E	T&A	1. Analysis report showing compliance with SSP 30240 Sec. 3. 2. Certificate of Compliance for the test	1. L-7.5 2. L-3.5	T&A	57217-NA-0032
3. 2. 4. 2 / 4. 3. 2. 4. 2	Electrical Bonding	E	T&A&I	1. Test report showing compliance with SSP 30245, and NSTS 1700.7B/ISS, 213 and 220.	1. L-7.5	T&A	57217-NA-0012

**TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
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IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
				2. Analysis report showing compliance with SSP 30245, NSTS 1700.7B/ISS, 213 and 220, and the Unique Payload Hardware ICD. 3. Certificate of Compliance for the inspection.	2. L-7.5 3. L-3.5		
3. 2. 4. 3 / 4. 3. 2. 4. 3	Cable/Wire Design and Control Requirements	E	I	1. Analysis report showing compliance with SSP 30242. 2. Certificate of Compliance for the test or inspection.	1. L-7.5 2. L-3.5	A	57218-NA-0021
3. 2. 4. 4 / 4. 3. 2. 4. 4	Electromagnetic Interference	E	T&A	1. Test Report 2. Analysis report for the integrated rack based on sub-rack and/or rack equipment test data.	1. L-7.5 2. L-7.5	T&A	57218-NA-0015A 57218-NA-0016A 57217-NA-0017A 57218-NA-0018 57218-NA-0035
3. 2. 4. 5 / 4. 3. 2. 4. 5	Electrostatic Discharge	E	A&I	1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling of integrated rack and EPCE.	1. L-7.5 2. L-3.5	T or A&I	57218-NA-0009

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 4. 6 / 4. 3. 2. 4. 6	Alternating Current (ac) Magnetic Fields	A	T	Test results that meet the limits of 3.2.4.6.	L-7.5	T	
3. 2. 4. 7 / 4. 3. 2. 4. 7	Direct Current (dc) Magnetic Fields	E	T	Test results that meet the limits of 3.2.4.7.	L-7.5	T	57218-NA-0013
3. 2. 4. 8 / 4. 3. 2. 4. 8	Corona	A	A	1. Detailed analysis of corona design techniques, voltage levels, and any gases plus operating environment. 2. Test report identifying test configuration plus the test results.	1. L-7.5 2. L-7.5	A	
3. 2. 4. 9 / 4. 3. 2. 4. 9	Lightning	A	A	Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1.	L-7.5	A	
3. 2. 4.10 / 4. 3. 2. 4.10	EMI Susceptibility for Safety-Critical Circuits	A	T&A	Analysis report with supporting test data.	L-7.5	A	
3. 2. 4.11 / 4. 3. 2. 4.11	Intentional Radiating and Receiving Certification	A	I	Certificate of Compliance	L-3.5	A	
3. 2. 5 / 4. 3. 2. 5	SAFETY REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 2. 5. 1 / 4. 3. 2. 5. 1	PAYLOAD ELECTRICAL SAFETY		TITLE	N/A	N/A	N/A	
3. 2. 5. 1. 1 / 4. 3. 2. 5. 1. 1	Mating/Demating of Powered Connectors	A	Safety[2]	Certificate of Compliance.	L-3.5	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 5. 1. 2 / 4. 3. 2. 5. 1. 2	Safety-Critical Circuits Redundancy	A	Safety[2]	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 2. A / 4. 3. 2. 5. 2. A	Rack Maintenance Switch (Rack Power Switch)	A	I	Drawing showing the size and location of the Rack Maintenance Switch (Rack Power Switch) for the inspection.	L-7.5	N/A	
3. 2. 5. 2. B / 4. 3. 2. 5. 2. B	Rack Maintenance Switch (Rack Power Switch)	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 2. C / 4. 3. 2. 5. 2. C	Rack Maintenance Switch (Rack Power Switch)	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 3. A / 4. 3. 2. 5. 3. A	Power Switches/Controls	A	A	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 3. B / 4. 3. 2. 5. 3. B	Power Switches/Controls	A	A	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 3. C / 4. 3. 2. 5. 3. C	Power Switches/Controls	A	A	Certificate of Compliance.	L-3.5	N/A	
3. 2. 5. 4 / 4. 3. 2. 5. 4	DELETED		N/A	N/A	N/A	N/A	
3. 2. 5. 5. A / 4. 3. 2. 5. 5. A	Portable Equipment/Power Cords	N/A	A	Certificate of Compliance.	L-3.5	N/A	The FIR does not provide any portable equipment
3. 2. 5. 5. B / 4. 3. 2. 5. 5. B	Portable Equipment/Power Cords	N/A	A	Certificate of Compliance.	L-3.5	N/A	The FIR does not provide any portable equipment
3. 2. 6 / 4. 3. 2. 6	MPLM		NVR	N/A	N/A	N/A	
3. 2. 6. 1. A / 4. 3. 2. 6. 1. A	MPLM Electrical Power Characteristics	N/A	T[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 1. B / 4. 3. 2. 6. 1. B	MPLM Electrical Power Characteristics	N/A	A[1]	Data cert providing plot of input voltages vs. frequency	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 1. C / 4. 3. 2. 6. 1. C	MPLM Electrical Power Characteristics	N/A	A[1]	Data cert providing plot of input voltages vs. frequency	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 1. D / 4. 3. 2. 6. 1. D	MPLM Electrical Power Characteristics	N/A	T or A[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 1. E / 4. 3. 2. 6. 1. E	MPLM Electrical Power Characteristics	N/A	A[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 1. F / 4. 3. 2. 6. 1. F	MPLM Electrical Power Characteristics	N/A	A[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 1. G / 4. 3. 2. 6. 1. G	MPLM Electrical Power Characteristics	N/A	A[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. A / 4. 3. 2. 6. 2. A	MPLM Electrical Power Interface	N/A	A[1]	Analysis of test data required by 4.3.2.2.4	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. B / 4. 3. 2. 6. 2. B	MPLM Electrical Power Interface	N/A	A[1]	Analysis report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. C / 4. 3. 2. 6. 2. C	MPLM Electrical Power Interface	N/A	T[1]	Test report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. D / 4. 3. 2. 6. 2. D	MPLM Electrical Power Interface	N/A	T&A[1]	Analysis and test data for each integrated rack and EPCE.	L-7.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 2. E / 4. 3. 2. 6. 2. E	MPLM Electrical Power Interface		NVR	N/A	N/A	N/A	
3. 2. 6. 2. F / 4. 3. 2. 6. 2. F	MPLM Electrical Power Interface	N/A	A[1]	Analysis report. (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required.	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 1. A / 4. 3. 2. 6. 2. 1. A	MPLM UIP Connector and Pin Assignments		NVR	N/A	N/A	N/A	
3. 2. 6. 2. 1. B / 4. 3. 2. 6. 2. 1. B	MPLM UIP Connector and Pin Assignments	N/A	I[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 1. C / 4. 3. 2. 6. 2. 1. C	MPLM UIP Connector and Pin Assignments	N/A	I[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 2 / 4. 3. 2. 6. 2. 2	Compatibility with RPC Soft Start/Stop in MPLM	N/A	T[1]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 3. A / 4. 3. 2. 6. 2. 3. A	MPLM Surge Current	N/A	T&A[1]	Analysis and test report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 3. B / 4. 3. 2. 6. 2. 3. B	MPLM Surge Current	N/A	T&A[1]	Analysis and test report	L-7.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 2. 3. C / 4. 3. 2. 6. 2. 3. C	MPLM Surge Current	N/A	T&A[1]	Analysis and test report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 3. D / 4. 3. 2. 6. 2. 3. D	MPLM Surge Current	N/A	T&A[1]	Analysis and test report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 4 / 4. 3. 2. 6. 2. 4	MPLM Reverse Energy/Current	N/A	A[1]	Data cert providing a plot of worst case reverse current and potential reverse current case conditions to SSP 57000, Table 3.2.2.5-1 allowables.	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 2. 5 / 4. 3. 2. 6. 2. 5	MPLM Payload Trip Ratings	N/A	A[1]	Analysis report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 3. A / 4. 3. 2. 6. 3. A	MPLM Electrical Power Consumer Constraints	N/A	A[1]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 3. B / 4. 3. 2. 6. 3. B	MPLM Electrical Power Consumer Constraints	N/A	I or A[1]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 3. C / 4. 3. 2. 6. 3. C	MPLM Electrical Power Consumer Constraints	N/A	A[1]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 3. D / 4. 3. 2. 6. 3. D	MPLM Electrical Power Consumer Constraints	N/A	Safety[1, 2]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 4. A / 4. 3. 2. 6. 4. A	MPLM Electromagnetic Compatibility	N/A	T&A[1]	1. Analysis report showing compliance with SSP 30240 Sec. 3. 2. Certificate of Compliance for the test	1. L-7.5 2. L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. B / 4. 3. 2. 6. 4. B	MPLM Electromagnetic Compatibility	N/A	T&A&I[1]	1. Test report showing compliance with SSP 30245, and NSTS 1700.7B/ISS, 213 and 220. 2. Analysis report showing compliance with SSP 30245, NSTS 1700.7B/ISS, 213 and 220, and the Unique Payload Hardware ICD. 3. Certificate of Compliance for the inspection.	1. L-7.5 2. L-7.5 3. L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. C / 4. 3. 2. 6. 4. C	MPLM Electromagnetic Compatibility	N/A	T or A or I[1]	1. Analysis report showing compliance with SSP 30242. 2. Certificate of Compliance for the test or inspection.	1. L-7.5 2. L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. D / 4. 3. 2. 6. 4. D	MPLM Electromagnetic Compatibility	N/A	T&A[1]	1. Test Report	1. L-7.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
				2. Analysis report for the integrated rack based on subrack and/or rack equipment test data.	2. L-7.5		
3. 2. 6. 4. E / 4. 3. 2. 6. 4. E	MPLM Electromagnetic Compatibility	N/A	T or A&I[1]	1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling of integrated rack and EPCE.	1. L-7.5 2. L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. F / 4. 3. 2. 6. 4. F	MPLM Electromagnetic Compatibility	N/A	T [1]	Test results that meet the limits of 3.2.4.6.	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. G / 4. 3. 2. 6. 4. G	MPLM Electromagnetic Compatibility	N/A	T [1]	Test results that meet the limits of 3.2.4.7.	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. H / 4. 3. 2. 6. 4. H	MPLM Electromagnetic Compatibility	N/A	T or A[1]	1. Detailed analysis of corona design techniques, voltage levels, and any gases plus operating environment. 2. Test report identifying test configuration plus the test results.	1. L-7.5 2. L-7.5	N/A	The FIR power is not connected in the MPLM.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 4. I / 4. 3. 2. 6. 4. I	MPLM Electromagnetic Compatibility	N/A	A[1]	Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1.	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. J / 4. 3. 2. 6. 4. J	MPLM Electromagnetic Compatibility	N/A	T&A[1]	Analysis report including applicable test data	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 4. 1 / 4. 3. 2. 6. 4. 1	MPLM Bonding	N/A	A[1]	Analysis report	L-7.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 5. A / 4. 3. 2. 6. 5. A	MPLM Safety Requirements	N/A	Safety[1, 2]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 5. B / 4. 3. 2. 6. 5. B	MPLM Safety Requirements	N/A	Safety[1, 2]	Certificate of Compliance	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 5. C / 4. 3. 2. 6. 5. C	MPLM Safety Requirements	N/A	I[1]	1. Drawing showing the size and location of the Rack Maintenance Switch (Rack Power Switch) for the inspection. 2. Certificate of Compliance.	1. L-7.5 2. L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 5. D / 4. 3. 2. 6. 5. D	MPLM Safety Requirements	N/A	A[1]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 2. 6. 5. E / 4. 3. 2. 6. 5. E	MPLM Safety Requirements		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 2. 6. 5. F / 4. 3. 2. 6. 5. F	MPLM Safety Requirements	N/A	A[1]	Certificate of Compliance.	L-3.5	N/A	The FIR power is not connected in the MPLM.
3. 3 / 4. 3. 3	COMMAND AND DATA HANDLING INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 3. 1 / 4. 3. 3. 1	DELETED		N/A	N/A	N/A	N/A	
3. 3. 2 / 4. 3. 3. 2	Word/Byte Notations, Types and Data Transmissions		NVR	N/A	N/A	N/A	
3. 3. 2. 1 / 4. 3. 3. 2. 1	Word/Byte Notations	A	I	Certificate of Compliance	L-3.5	I	
3. 3. 2. 2 / 4. 3. 3. 2. 2	Data Types	A	I	Certificate of Compliance	L-3.5	I	
3. 3. 2. 3. A / 4. 3. 3. 2. 3. A	Data Transmissions	A	I	Certificate of Compliance	L-3.5	I	
3. 3. 2. 3. B / 4. 3. 3. 2. 3. B	Data Transmissions	A	I	Certificate of Compliance	L-3.5	I	
3. 3. 2. 3. C / 4. 3. 3. 2. 3. C	Data Transmissions	A	I	Certificate of Compliance	L-3.5	I	
3. 3. 3 / 4. 3. 3. 3	DELETED		N/A	N/A	N/A	N/A	
3. 3. 4 / 4. 3. 3. 4	Consultative Committee For Space Data Systems		NVR	N/A	N/A	N/A	
3. 3. 4. 1. A / 4. 3. 3. 4. 1. A	CCSDS Data	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. B / 4. 3. 3. 4. 1. B	CCSDS Data	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. C / 4. 3. 3. 4. 1. C	CCSDS Data	A	T	Certificate of Compliance	L-3.5	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 4. 1. 1 / 4. 3. 3. 4. 1. 1	CCSDS Data Packets	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. 1. 1 / 4. 3. 3. 4. 1. 1. 1	CCSDS Primary Header	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. 1. 2. A / 4. 3. 3. 4. 1. 1. 2. A	CCSDS Secondary Header	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. 1. 2. B / 4. 3. 3. 4. 1. 1. 2. B	CCSDS Secondary Header	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 4. 1. 2 / 4. 3. 3. 4. 1. 2	CCSDS Data Field	A	T	COC for testing.	L-3.5	N/A	
3. 3. 4. 1. 3 / 4. 3. 3. 4. 1. 3	CCSDS Data Bitstream	A	T	COC for testing.	L-3.5	N/A	
3. 3. 4. 1. 4 / 4. 3. 3. 4. 1. 4	CCSDS Application Process Identification Field		NVR	N/A	N/A	N/A	
3. 3. 4. 2 / 4. 3. 3. 4. 2	CCSDS TIME CODES		TITLE	N/A	N/A	N/A	
3. 3. 4. 2. 1 / 4. 3. 3. 4. 2. 1	CCSDS Unsegmented Time	A	T	Certificate of Compliance for the test.	L-3.5	N/A	
3. 3. 4. 2. 2 / 4. 3. 3. 4. 2. 2	CCSDS Segmented Time		NVR	N/A	N/A	N/A	
3. 3. 5 / 4. 3. 3. 5	MIL-STD-1553B Low Rate Data Link (LRDL)	A	T	Certificate of Compliance	L-3.5	T&I	
3. 3. 5. 1 / 4. 3. 3. 5. 1	MIL-STD-1553B PROTOCOL		TITLE	N/A	N/A	N/A	
3. 3. 5. 1. 1 / 4. 3. 3. 5. 1. 1	Standard Messages	A	T	Certificate of Compliance	L-3.5	T&I	
3. 3. 5. 1. 2 / 4. 3. 3. 5. 1. 2	Commanding	A	T	Certificate of Compliance	L-3.5	T&I	
3. 3. 5. 1. 3. A / 4. 3. 3. 5. 1. 3. A	Health and Status Data	A	T	Certificate of Compliance	L-3.5	T&I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 5. 1. 3. B / 4. 3. 3. 5. 1. 3. B	Health and Status Data	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1. 3. C / 4. 3. 3. 5. 1. 3. C	Health and Status Data	N/A	T	Certificate of Compliance	L-3.5	N/A	No powered interface with the MPLM
3. 3. 5. 1. 3. D / 4. 3. 3. 5. 1. 3. D	Health and Status Data	N/A	T	Certificate of Compliance	L-3.5	N/A	No powered interface with the MPLM
3. 3. 5. 1. 3. E / 4. 3. 3. 5. 1. 3. E	Health and Status Data	N/A	T	Certificate of Compliance	L-3.5	N/A	No powered interface with the MPLM
3. 3. 5. 1. 4. A / 4. 3. 3. 5. 1. 4. A	Safety Data	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 5. 1. 4. B / 4. 3. 3. 5. 1. 4. B	Safety Data	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 5. 1. 4. 1 / 4. 3. 3. 5. 1. 4. 1	Caution and Warning		NVR	N/A	N/A	N/A	
3. 3. 5. 1. 4. 1. 1 / 4. 3. 3. 5. 1. 4. 1. 1	Class 1 - Emergency		NVR	N/A	N/A	N/A	
3. 3. 5. 1. 4. 1. 2 / 4. 3. 3. 5. 1. 4. 1. 2	Class 2 - Warning	A	A&T	Data Cert providing analysis and test results.	L-7.5	A&T	
3. 3. 5. 1. 4. 1. 3 / 4. 3. 3. 5. 1. 4. 1. 3	Class 3 - Caution	A	A&T	Data Cert providing analysis and test results.	L-7.5	A&T	
3. 3. 5. 1. 4. 1. 4 / 4. 3. 3. 5. 1. 4. 1. 4	Class 4 - Advisory	A	A&T	Data Cert providing analysis and test results.	L-7.5	A&T	
3. 3. 5. 1. 5 / 4. 3. 3. 5. 1. 5	Service Requests	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1. 6 / 4. 3. 3. 5. 1. 6	Ancillary Data		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 5. 1. 7 / 4. 3. 3. 5. 1. 7	File Transfer	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1. 8 / 4. 3. 3. 5. 1. 8	Low Rate Telemetry	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1. 9 / 4. 3. 3. 5. 1. 9	Defined Mode Codes		NVR	N/A	N/A	N/A	
3. 3. 5. 1.10 / 4. 3. 3. 5. 1.10	Implemented Mode Codes	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1.11 / 4. 3. 3. 5. 1.11	Unimplemented/Undefined Mode Codes	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 1.12 / 4. 3. 3. 5. 1.12	Illegal Commands	A	T	Certificate of Compliance	L-3.5	T	
3. 3. 5. 2 / 4. 3. 3. 5. 2	MIL-STD-1553B LOW RATE DATA LINK (LRDL) INTERFACE CHARACTERISTICS		TITLE	N/A	N/A	N/A	
3. 3. 5. 2. 1 / 4. 3. 3. 5. 2. 1	LRDL REMOTE TERMINAL ASSIGNMENT		TITLE	N/A	N/A	N/A	
3. 3. 5. 2. 1. 1 / 4. 3. 3. 5. 2. 1. 1	LRDL CONNECTOR/PIN ASSIGNMENTS		TITLE	N/A	N/A	N/A	
3. 3. 5. 2. 1. 2. A / 4. 3. 3. 5. 2. 1. 2. A	MIL-STD-1553B Bus A and B Connector/Pin Assignment		NVR	N/A	N/A	N/A	
3. 3. 5. 2. 1. 2. B / 4. 3. 3. 5. 2. 1. 2. B	MIL-STD-1553B Bus A and B Connector/Pin Assignment	A	I&T	Certificate of Compliance.	L-3.5	N/A	
3. 3. 5. 2. 1. 2. C / 4. 3. 3. 5. 2. 1. 2. C	MIL-STD-1553B Bus A and B Connector/Pin Assignment	A	I&T	Certificate of Compliance.	L-3.5	N/A	
3. 3. 5. 2. 1. 3 / 4. 3. 3. 5. 2. 1. 3	DELETED		N/A	N/A	N/A	N/A	
3. 3. 5. 2. 1. 4. A / 4. 3. 3. 5. 2. 1. 4. A	Remote Terminal Hardwired Address Coding	A	T	Certificate of Compliance	L-3.5	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 5. 2. 1. 4. B / 4. 3. 3. 5. 2. 1. 4. B	Remote Terminal Hardwired Address Coding	A	I	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 2. 1. 4. C / 4. 3. 3. 5. 2. 1. 4. C	Remote Terminal Hardwired Address Coding	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 2. 1. 4. D / 4. 3. 3. 5. 2. 1. 4. D	Remote Terminal Hardwired Address Coding	A	I	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 2. 2 / 4. 3. 3. 5. 2. 2	LRDL Signal Characteristics	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 2. 3. A / 4. 3. 3. 5. 2. 3. A	LRDL Cabling	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 3. 5. 2. 3. B / 4. 3. 3. 5. 2. 3. B	LRDL Cabling	A	I	Certificate of Compliance	L-3.5	N/A	
3. 3. 5. 2. 4 / 4. 3. 3. 5. 2. 4	Multi-Bus Isolation	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 6 / 4. 3. 3. 6	MEDIUM RATE DATA LINK (MRDL)		TITLE	N/A	N/A	N/A	
3. 3. 6. 1 / 4. 3. 3. 6. 1	MRDL Protocol	A	I&T	Certificate of Compliance	L-3.5	I&T	
3. 3. 6. 1. 1 / 4. 3. 3. 6. 1. 1	Integrated Rack Protocols on the MRDL	A	I&T	Certificate of Compliance	L-3.5	N/A	
3. 3. 6. 1. 2. A / 4. 3. 3. 6. 1. 2. A	MRDL Address	A	A&T	Certificate of Compliance	L-3.5	A&T	
3. 3. 6. 1. 2. B / 4. 3. 3. 6. 1. 2. B	MRDL Address	A	A&T	Certificate of Compliance	L-3.5	T	
3. 3. 6. 1. 2. C / 4. 3. 3. 6. 1. 2. C	MRDL Address	A	T	Certificate of Compliance	L-3.5	T	
3. 3. 6. 1. 3. A / 4. 3. 3. 6. 1. 3. A	ISPR MRDL Connectivity	A	I	Certificate of Compliance	L-3.5	N/A	
3. 3. 6. 1. 3. B / 4. 3. 3. 6. 1. 3. B	ISPR MRDL Connectivity	A	T	Certificate of Compliance	L-3.5	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 6. 1. 3. C / 4. 3. 3. 6. 1. 3. C	ISPR MRDL Connectivity	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3. 6. 1. 4. A / 4. 3. 3. 6. 1. 4. A	MRDL Connector/Pin Assignments		NVR	N/A	N/A	N/A	
3. 3. 6. 1. 4. B / 4. 3. 3. 6. 1. 4. B	MRDL Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 3. 6. 1. 4. C / 4. 3. 3. 6. 1. 4. C	MRDL Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 3. 6. 1. 5 / 4. 3. 3. 6. 1. 5	MRDL Signal Characteristics	A	I&T	Certificate of Compliance	L-3.5	N/A	
3. 3. 6. 1. 6 / 4. 3. 3. 6. 1. 6	MRDL Cable Characteristics	A	I	Certificate of Compliance.	L-3.5	I	
3. 3. 7 / 4. 3. 3. 7	High Rate Data Link (HRDL)		NVR	N/A	N/A	N/A	
3. 3. 7. 1 / 4. 3. 3. 7. 1	Payload to High Rate Frame Multiplexer (HRFM) Protocols	A	T&I	Certificate of Compliance	L-3.5	N/A	
3. 3. 7. 1. 1 / 4. 3. 3. 7. 1. 1	CCSDS PACKET PROTOCOL		NVR	N/A	N/A	N/A	
3. 3. 7. 1. 1. 1 / 4. 3. 3. 7. 1. 1. 1	Packet Data Frames	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 7. 1. 1. 2 / 4. 3. 3. 7. 1. 1. 2	Packet Data Rates	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 7. 1. 1. 3 / 4. 3. 3. 7. 1. 1. 3	Packet Format	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 7. 1. 2 / 4. 3. 3. 7. 1. 2	Bitstream Protocol		NVR	N/A	N/A	N/A	
3. 3. 7. 1. 2. 1 / 4. 3. 3. 7. 1. 2. 1	Data Frames	A	T&I	Certificate of Compliance	L-3.5	T&I	
3. 3. 7. 1. 2. 2 / 4. 3. 3. 7. 1. 2. 2	Data Rates	A	T&I	Certificate of Compliance	L-3.5	T&I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 7. 2 / 4. 3. 3. 7. 2	HRDL Interface Characteristics		NVR	N/A	N/A	N/A	
3. 3. 7. 2. 1 / 4. 3. 3. 7. 2. 1	Physical Signaling	A	T&A	Data Cert providing rates, signal coding, and control signals.	L-7.5	T&A	
3. 3. 7. 2. 1. 1. A / 4. 3. 3. 7. 2. 1. 1. A	DELETED		N/A	N/A	N/A	N/A	
3. 3. 7. 2. 1. 1. B / 4. 3. 3. 7. 2. 1. 1. B	Physical Signaling Data Rates	A	T	Data Cert providing rates, signal coding, and control signals.	L-7.5	T	
3. 3. 7. 2. 1. 1. C / 4. 3. 3. 7. 2. 1. 1. C	Physical Signaling Data Rates		NVR	N/A	N/A	N/A	
3. 3. 7. 2. 2 / 4. 3. 3. 7. 2. 2	Encoding	A	T	Data Cert providing rates, signal coding, and control signals.	L-7.5	T	
3. 3. 7. 3 / 4. 3. 3. 7. 3	INTEGRATED RACK HRDL OPTICAL POWER		TITLE	N/A	N/A	N/A	
3. 3. 7. 3. 1 / 4. 3. 3. 7. 3. 1	Integrated Rack HRDL Transmitted Optical Power	A	T	Certificate of Compliance	L-3.5	T	
3. 3. 7. 3. 2 / 4. 3. 3. 7. 3. 2	Integrated Rack HRDL Received Optical Power	N/A	T	Certificate of Compliance	L-3.5	T	The FIR does not have a receiver for optical power
3. 3. 7. 4 / 4. 3. 3. 7. 4	HRDL Fiber Optical Cable	A	I	Certificate of Compliance.	L-3.5	I	
3. 3. 7. 5 / 4. 3. 3. 7. 5	HRDL Fiber Optical Cable Bend Radius	A	I	Certificate of Compliance.	L-3.5	I	
3. 3. 7. 6. A / 4. 3. 3. 7. 6. A	HRDL Connectors and Fiber		NVR	N/A	N/A	N/A	
3. 3. 7. 6. B / 4. 3. 3. 7. 6. B	HRDL Connectors and Fiber	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 7. 6. C / 4. 3. 3. 7. 6. C	HRDL Connectors and Fiber	A	I	Certificate of Compliance.	L-3.5	I	
3. 3. 7. 6. D / 4. 3. 3. 7. 6. D	HRDL Connectors and Fiber	A	I	Certificate of Compliance.	L-3.5	I	
3. 3. 7. 7 / 4. 3. 3. 7. 7	DELETED		N/A	N/A	N/A	N/A	
3. 3. 7. 8 / 4. 3. 3. 7. 8	HRDL State	A	A	Certificate of Compliance	L-3.5	N/A	
3. 3. 8. A / 4. 3. 3. 8. A	Laptop Computers	A	I or A	Certificate of Compliance	L-3.5	N/A	
3. 3. 8.B / 4. 3. 3. 8.B	Laptop Computers	A	D	Certificate of Compliance	L-3.5	D	
3. 3. 8. 1. A / 4. 3. 3. 8. 1. A	Payload Rack Laptop	N/A	I	Certificate of Compliance	L-3.5	N/A	The FIR does not utilize a unique payload laptop
3. 3. 8. 1. B / 4. 3. 3. 8. 1. B	DELETED		N/A	N/A	N/A	N/A	
3. 3. 8. 1. C / 4. 3. 3. 8. 1. C	DELETED		N/A	N/A	N/A	N/A	
3. 3. 8. 1. D / 4. 3. 3. 8. 1. D	Payload Rack Laptop	N/A	I	Certificate of Compliance	L-3.5	N/A	The FIR does not utilize a unique payload laptop
3. 3. 8. 1. E / 4. 3. 3. 8. 1. E	DELETED		N/A	N/A	N/A	N/A	
3. 3. 8. 1. F / 4. 3. 3. 8. 1. F	DELETED		N/A	N/A	N/A	N/A	
3. 3. 8. 1. G / 4. 3. 3. 8. 1. G	DELETED		N/A	N/A	N/A	N/A	
3. 3. 8. 1. H / 4. 3. 3. 8. 1. H	DELETED		N/A	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3. 8. 1. I / 4. 3. 3. 8. 1. I	Payload Rack Laptop	N/A	I	Certificate of Compliance	L-12	N/A	CIR does not utilize a unique payload laptop
3. 3. 8. 2 / 4. 3. 3. 8. 2	PCS		NVR	N/A	N/A	N/A	
3. 3. 8. 3 / 4. 3. 3. 8. 3	SSC		NVR	N/A	N/A	N/A	
3. 3. 9 / 4. 3. 3. 9	UOP		NVR	N/A	N/A	N/A	
3.3.10 / 4.3. 3.10	MAINTENANCE SWITCH, SMOKE DETECTOR, SMOKE INDICATOR, AND INTEGRATED RACK FAN INTERFACES		TITLE	N/A	N/A	N/A	
3. 3.10.1 / 4. 3. 3.10. 1	Rack Maintenance Switch (Rack Power Switch) Interfaces	A	T	Certificate of Compliance	L-3.5	N/A	
3. 3.10. 2 / 4. 3. 3.10. 2	Smoke Detector Interfaces		NVR	N/A	N/A	N/A	
3. 3.10. 2. 1 / 4. 3. 3.10. 2. 1	Analog Interface Characteristics	A	I	Certificate of Compliance	L-3.5	I	
3. 3.10. 2. 2 / 4. 3. 3.10. 2. 2	Discrete Command Built-In-Test Interface Characteristics	A	I	Certificate of Compliance	L-3.5	I	
3. 3.10. 2. 3 / 4. 3. 3.10. 2. 3	Smoke Indicator Electrical Interfaces	A	A&T	Certificate of Compliance	L-3.5	N/A	
3. 3.10. 2.4 / 4. 3. 3.10. 2. 4	Fan Ventilation Status Electrical Interfaces	E	I	Certificate of Compliance	L-3.5	N/A	57217-NA-0041A
3. 3.10. 3. A / 4. 3. 3.10. 3. A	Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 3.10. 3.B / 4. 3. 3.10.3.B	Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 3.10. 3. C / 4. 3. 3.10. 3. C	Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 4 / 4. 3. 4	Payload NTSC Video and Audio Interface Requirement		NVR	N/A	N/A	N/A	
3. 4. 1 / 4. 3. 4. 1	PAYLOAD NTSC VIDEO INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 4. 1. 1. A / 4. 3. 4. 1. 1. A	Payload NTSC Video Characteristics for Fiber Optic Video	A	T	Certificate of Compliance	L-3.5	T	
3. 4. 1. 1. B / 4. 3. 4. 1. 1. B	DELETED		N/A	N/A	N/A	N/A	
3. 4. 1. 1. C / 4. 3. 4. 1. 1. C	Payload NTSC Video Characteristics for Fiber Optic Video	A	T	Certificate of Compliance	L-3.5	T	
3. 4. 1. 2 / 4. 3. 4. 1. 2	NTSC FIBER OPTIC VIDEO		TITLE	N/A	N/A	N/A	
3. 4. 1. 2. 1. A / 4. 3. 4. 1. 2. 1. A	Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics	A	T	Certificate of Compliance	L-3.5	T	
3. 4. 1. 2. 1. B / 4. 3. 4. 1. 2. 1. B	Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics	A	T	Data providing PFM fiber optic video signal characteristics.	L-7.5	T	
3. 4. 1. 2. 2 / 4. 3. 4. 1. 2. 2	Integrated Rack NTSC PFM Video Transmitted Optical Power	A	T	Certificate of Compliance	L-3.5	T	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 4. 1. 2. 3 / 4. 3. 4. 1. 2. 3	Integrated Rack NTSC PFM Video and Sync Signal Received Optical Power	N/A	T	Certificate of Compliance	L-3.5	T	FIR will only send, and not receive PFM video or sync signal.
3. 4. 1. 2. 4 / 4. 3. 4. 1. 2. 4	Fiber Optic Cable Characteristics	A	I	Data providing electrical video characteristics.	L-7.5	N/A	
3. 4. 1. 2. 5 / 4. 3. 4. 1. 2. 5	PFM NTSC Video Fiber Optic Cable Bend Radius	A	I	Certificate of Compliance.	L-3.5	N/A	
3. 4. 1. 2. 6 / 4. 3. 4. 1. 2. 6	DELETED		N/A	N/A	N/A	N/A	
3. 4. 1. 2. 7. A / 4. 3. 4. 1. 2. 7. A	PFM NTSC Optical Connector/Pin Assignments		NVR	N/A	N/A	N/A	
3. 4. 1. 2. 7. B / 4. 3. 4. 1. 2. 7. B	PFM NTSC Optical Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	I	
3. 4. 1. 2. 7. C / 4. 3. 4. 1. 2. 7. C	PFM NTSC Optical Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	I	
3. 4. 1. 3 / 4. 3. 4. 1. 3	NTSC ELECTRICAL VIDEO INTERFACES		TITLE	N/A	N/A	N/A	
3. 4. 1. 3. 1 / 4. 3. 4. 1. 3. 1	Cables	N/A	I	Certificate of Compliance	L-3.5	I	The FIR does not interface to the JEM
3. 4. 1. 3. 2 / 4. 3. 4. 1. 3. 2	Signal Standard	N/A	T	Certificate of Compliance	L-3.5	T	The FIR does not interface to the JEM
3. 4. 1. 3. 3 / 4. 3. 4. 1. 3. 3	Interface Circuit	N/A	A	Certificate of Compliance	L-3.5	A	The FIR does not interface to the JEM
3. 4. 1. 3. 4 / 4. 3. 4. 1. 3. 4	Cross Talk	N/A	T	Certificate of Compliance	L-3.5	T	The FIR does not interface to the JEM

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 4. 1. 4. A / 4. 3. 4. 1. 4. A	NTSC Electrical Connector/Pin Assignments		NVR	N/A	N/A	N/A	
3. 4. 1. 4. B / 4. 3. 4. 1. 4. B	NTSC Electrical Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	I	
3. 4. 1. 4. C / 4. 3. 4. 1. 4. C	NTSC Electrical Connector/Pin Assignments	A	I	Certificate of Compliance.	L-3.5	I	
3. 4. 2 / 4. 3. 4. 2	U.S. Element Audio Interface Requirements		NVR	N/A	N/A	N/A	
3. 5 / 4. 3. 5	THERMAL CONTROL INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 5. 1 / 4. 3. 5. 1	INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 5. 1. 1. A / 4. 3. 5. 1. 1. A	Physical Interface		NVR	N/A	N/A	N/A	
3. 5. 1. 1. B / 4. 3. 5. 1. 1. B	Physical Interface		NVR	N/A	N/A	N/A	
3. 5. 1. 2. A / 4. 3. 5. 1. 2. A	DELETED		N/A	N/A	N/A	N/A	
3. 5. 1. 2. B / 4. 3. 5. 1. 2. B	ITCS Fluid Charging and Expansion	A	T	Certificate of Compliance.	L-3.5	T	
3. 5. 1. 2. C / 4. 3. 5. 1. 2. C	ITCS Fluid Charging and Expansion	N/A	I&A	Certificate of Compliance.	L-3.5	I&A	FIR does not interface with the MPLM TCS
3. 5. 1. 2. D / 4. 3. 5. 1. 2. D	ITCS Fluid Charging and Expansion	A	I&A	Certificate of Compliance.	L-3.5	I&A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 5. 1. 2. E / 4. 3. 5. 1. 2. E	ITCS Fluid Charging and Expansion	N/A	T	Certificate of Compliance.	L-3.5	T	FIR does not have a thermal expansion device that remains connected to the rack while the rack is connected to the on-orbit ITCS.
3. 5. 1. 3 / 4. 3. 5. 1. 3	ITCS PRESSURE DROP		TITLE	N/A	N/A	N/A	
3. 5. 1. 3. 1. A / 4. 3. 5. 1. 3. 1. A	On-Orbit Interfaces	A	T	Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour).	L-7.5	T&A	The FIR will be operated only in the USL (Ref. Paragraph 3.5.1.2)
3. 5. 1. 3. 1. B / 4. 3. 5. 1. 3. 1. B	On-Orbit Interfaces	A	T	Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour).	L-7.5	T&A	The FIR will be operated only in the USL (Ref. Paragraph 3.5.1.2)
3. 5. 1. 3. 1. C / 4. 3. 5. 1. 3. 1. C	On-Orbit Interfaces	N/A	T	Data Cert showing that the rack controls the flow rate and operates normally at flow rates measured at the design pressure drop, the design pressure drop +1 psid, and the design pressure drop -1 psid.	L-7.5	A	No Simultaneous Cooling
3. 5. 1. 3. 2 / 4. 3. 5. 1. 3. 2	MPLM Interfaces	N/A	T[1]	Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour).	L-7.5	N/A	The FIR does not require active cooling in the MPLM

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 5. 1. 4. A / 4. 3. 5. 1. 4. A	Coolant Flow Rate - MTL	A	T	Data Cert providing power data (in kW) and flow rate (in lbm per hour) for each mode of operation in tabular form.	L-7.5	A	
3. 5. 1. 4. B / 4. 3. 5. 1. 4. B	Coolant Flow Rate - LTL	N/A	T or A	Data Cert providing power data (in kW) and flow rate (in lbm per hour) for each mode of operation in tabular form.	L-7.5	A	The FIR does not utilize the LTL
3. 5. 1. 5. A / 4. 3. 5. 1. 5. A	Coolant Supply Temperature - MTL		NVR	N/A	N/A	N/A	
3. 5. 1. 5. B / 4. 3. 5. 1. 5. B	Coolant Supply Temperature - LTL		NVR	N/A	N/A	N/A	
3. 5. 1. 6. A / 4. 3. 5. 1. 6. A	Coolant Return Temperature	E	T&A	Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form.	L-7.5	A	57218-NA-0002A
3. 5. 1. 6. B / 4. 3. 5. 1. 6. B	Coolant Return Temperature	E	A	Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form.	L-7.5	A	57218-NA-0002A

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 5. 1. 6. C / 4. 3. 5. 1. 6. C	Coolant Return Temperature	A	T&A	Data Cert providing return coolant temperature (in Fahrenheit) and power data in(in KW) for each mode of operation in tabular form.	L-7.5	A	
3. 5. 1. 6. D / 4. 3. 5. 1. 6. D	Coolant Return Temperature	N/A	T&A	Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form.	L-7.5	A	The FIR does not utilize the LTL
3. 5. 1. 7. A / 4. 3. 5. 1. 7. A	Coolant Maximum Design Pressure - MTL	A	T	Certificate of Compliance.	L-7.5	T&A	
3. 5. 1. 7. B / 4. 3. 5. 1. 7. B	Coolant Maximum Design Pressure - LTL	N/A	T	Certificate of Compliance.	L-7.5	T&A	The FIR does not utilize the LTL
3. 5. 1. 7. C / 4. 3. 5. 1. 7. C	Coolant Maximum Design Pressure - MPLM Temperature Loop	N/A	T[1]	Certificate of Compliance.	L-7.5	N/A	The FIR does not require active cooling in the MPLM
3. 5. 1. 8 / 4. 3. 5. 1. 8	Fail Safe Design	A	A	Certificate of Compliance.	L-3.5	A or A&T	
3. 5. 1. 9. A / 4. 3. 5. 1. 9. A	Leakage	A	T	Data Cert providing leakage test results (in scc per hour).	L-7.5	T&A	
3. 5. 1. 9. B / 4. 3. 5. 1. 9. B	Leakage	N/A	T	Data Cert providing leakage test results (in scc per hour).	L-7.5	T&A	The FIR does not operate in the MPLM

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 5. 1.10 / 4. 3. 5. 1.10	Quick-Disconnect Air Inclusion	A	A	Certificate of Compliance.	L-3.5	T or A	
3. 5. 1.11 / 4. 3. 5. 1.11	Rack Front Surface Temperature	A	T	Certificate of Compliance.	L-3.5	T or A	
3. 5. 1.12 / 4. 3. 5. 1.12	Cabin Air Heat Leak	A	A	Data Cert providing integrated rack-to-cabin heat leak analysis results.	L-7.5	A	
3. 5. 1.13 / 4. 3. 5. 1.13	MPLM Cabin Air Cooling	N/A	A[1]	Data Cert providing analysis results (in watts) that the cabin air cooling (heat absorbed) of the integrated rack is within limits.	L-7.5	N/A	The FIR does not operate in the MPLM
3. 5. 1.14. A / 4. 3. 5. 1.14. A	Simultaneous Cooling	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize simultaneous cooling
3. 5. 1.14. B / 4. 3. 5. 1.14. B	Simultaneous Cooling	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not utilize simultaneous cooling
3. 5. 1.15 / 4. 3. 5. 1.15	Control System Time Constant	A	T	Certificate of Compliance.	L-3.5	T	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 5. 1.16 / 4. 3. 5. 1.16	Payload Coolant Quantity	A	T	Data Cert providing integrated rack coolant quantity (in liters normalized to the 16.1 degrees C (61 degrees F) reference temperature as provided in the Unique Payload Hardware ICD).	L-7.5	T or A	
3. 6 / 4. 3. 6	VACUUM SYSTEM REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 6. 1 / 4. 3. 6. 1	VACUUM EXHAUST SYSTEM (VES)/WASTE GAS SYSTEM (WGS) REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 6. 1. 1 / 4. 3. 6. 1. 1	VES/WGS Physical Interface		NVR	N/A	N/A	N/A	
3. 6. 1. 2. A / 4. 3. 6. 1. 2. A	Input Pressure Limit	A	T&A	Certificate of Compliance.	L-3.5	T&A	
3. 6. 1. 2. B / 4. 3. 6. 1. 2. B	Input Pressure Limit	A	T&A	Certificate of Compliance.	L-3.5	T&A	
3. 6. 1. 2. C / 4. 3. 6. 1. 2. C	Input Pressure Limit	A	A	Certificate of Compliance.	L-3.5	A	
3. 6. 1. 3 / 4. 3. 6. 1. 3	Input Temperature Limit	A	T	Certificate of Compliance.	L-3.5	T	
3. 6. 1. 4 / 4. 3. 6. 1. 4	Input Dewpoint Limit	A	T	Certificate of Compliance.	L-3.5	T	
3. 6. 1. 5. A / 4. 3. 6. 1. 5. A	Acceptable Exhaust Gases	A	A	Data Cert providing constituents of vented gas, volume, concentration, temperature, and pressure	L-7.5	T or A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 6. 1. 5. B / 4. 3. 6. 1. 5. B	Acceptable Exhaust Gases	A	A	Data Cert showing the integrated rack gases vented to the ISS VES/WGS are non-reactive with other vent gas mixture constituents	L-7.5	A	
3. 6. 1. 5. C / 4. 3. 6. 1. 5. C	Acceptable Exhaust Gases	A	A	Data Cert showing that integrated racks venting in the ISS VES/WGS provide a means to remove gases that should adhere to the VES/WGS tubing walls.	L-7.5	A	
3. 6. 1. 5. D / 4. 3. 6. 1. 5. D	Acceptable Exhaust Gases	A	A	Data Cert Showing that all particulates larger than 100 micrometers are removed prior to venting to the VES/WGS.	L-7.5	A	
3. 6. 1. 5. 1. A / 4. 3. 6. 1. 5. 1. A	Acceptable Gases List		NVR	N/A	N/A	N/A	
3. 6. 1. 5. 1. B / 4. 3. 6. 1. 5. 1. B	Acceptable Gases List		NVR	N/A	N/A	N/A	
3. 6. 1. 5. 1. C / 4. 3. 6. 1. 5. 1. C	Acceptable Gases List		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 6. 1. 5. 2 / 4. 3. 6. 1. 5. 2	External Contamination Control	A	A	Data Cert providing the required list of vented gas characteristics (vented gas constituents, mass, temperature, concentration, maximum particulate size, maximum flow rate, and pressure).	L-7.5	A	
3. 6. 1. 6 / 4. 3. 6. 1. 6	Payload Vacuum System Access Valve	A	I&A	Certificate of Compliance.	L-3.5	I&A	
3. 6. 1. 7. A / 4. 3. 6. 1. 7. A	Limit Amount of Vented Gases	A	A	Analysis report showing that the amount of gas vented is below either the mass limit or pressure-volume limit for any 9-minute period.	L-7.5	A	
3. 6. 1. 7. B / 4. 3. 6. 1. 7. B	Limit Amount of Vented Gases	A	A	Analysis report showing that the amount of gas vented is below either the mass limit or pressure-volume limit for any 9-minute period.	L-7.5	A	
3. 6. 2 / 4. 3. 6. 2	VACUUM RESOURCE SYSTEM (VRS)/VACUUM VENT SYSTEM (VVS) REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 6. 2. 1 / 4. 3. 6. 2. 1	VRS/VVS Physical Interface		NVR	N/A	N/A	N/A	
3. 6. 2. 2. A / 4. 3. 6. 2. 2. A	Input Pressure Limit	A	T	Certificate of Compliance.	L-3.5	T	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 6. 2. 2. B / 4. 3. 6. 2. 2. B	Input Pressure Limit	A	T&A	Certificate of Compliance.	L-3.5	T&A	
3. 6. 2. 2. C / 4. 3. 6. 2. 2. C	Input Pressure Limit	A	A	Certificate of Compliance.	L-3.5	A	
3. 6. 2. 3 / 4. 3. 6. 2. 3	VRS/VVS Through-Put Limit	A	T	Certificate of Compliance.	L-3.5	T	
3. 6. 2. 4 / 4. 3. 6. 2. 4	Acceptable Gases		NVR	N/A	N/A	N/A	
3. 6. 3 / 4. 3. 6. 3	Vacuum Outgassing Requirements	A	I	Certificate of Compliance	L-3.5	I	
3. 7 / 4. 3. 7	PRESSURIZED GASES INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 7. 1 / 4. 3. 7. 1	NITROGEN INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 7. 1. 1. A / 4. 3. 7. 1. 1. A	Nitrogen Interface Control	A	T	Certificate of Compliance.	L-3.5	T	
3. 7. 1. 1. B / 4. 3. 7. 1. 1. B	Nitrogen Interface Control	A	T	Certificate of Compliance.	L-3.5	T&A	
3. 7. 1. 2 / 4. 3. 7. 1. 2	Nitrogen Interface MDP	A	T&A	Certificate of Compliance.	L-7.5	T&A	
3. 7. 1. 3 / 4. 3. 7. 1. 3	Nitrogen Interface Temperature		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 7. 1. 4 / 4. 3. 7. 1. 4	Nitrogen Leakage	E	T	Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided.	L-7.5	T or T&A	57202-NA-0033B
3. 7. 1. 5 / 4. 3. 7. 1. 5	Nitrogen Physical Interface		NVR	N/A	N/A	N/A	
3. 7. 2 / 4. 3. 7. 2	ARGON INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 7. 2. 1. A / 4. 3. 7. 2. 1. A	Argon Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T	The FIR does not utilize the Argon interface
3. 7. 2. 1. B / 4. 3. 7. 2. 1. B	Argon Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T&A	The FIR does not utilize the Argon interface
3. 7. 2. 2 / 4. 3. 7. 2. 2	Argon Interface MDP	N/A	T&A	Certificate of Compliance.	L-7.5	T&A	The FIR does not utilize the Argon interface
3. 7. 2. 3 / 4. 3. 7. 2. 3	Argon Interface Temperature		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 7. 2. 4 / 4. 3. 7. 2. 4	Argon Leakage	N/A	T or T&A	Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided.	L-7.5	T or T&A	The FIR does not utilize the Argon interface
3. 7. 2. 5 / 4. 3. 7. 2. 5	Argon Physical Interface		NVR	N/A	N/A	N/A	
3. 7. 3 / 4. 3. 7. 3	CARBON DIOXIDE INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 7. 3. 1. A / 4. 3. 7. 3. 1. A	Carbon Dioxide Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T	The FIR does not utilize the CO_2 interface
3. 7. 3. 1. B / 4. 3. 7. 3. 1. B	Carbon Dioxide Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T&A	The FIR does not utilize the CO_2 interface
3. 7. 3. 2 / 4. 3. 7. 3. 2	Carbon Dioxide Interface MDP	N/A	T&A	Certificate of Compliance.	L-7.5	T&A	The FIR does not utilize the CO_2 interface
3. 7. 3. 3 / 4. 3. 7. 3. 3	Carbon Dioxide Interface Temperature		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 7. 3. 4 / 4. 3. 7. 3. 4	Carbon Dioxide Leakage	N/A	T or T&A	Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided.	L-7.5	T or T&A	The FIR does not utilize the CO_2 interface
3. 7. 3. 5 / 4. 3. 7. 3. 5	Carbon Dioxide Physical Interface		NVR	N/A	N/A	N/A	
3. 7. 4 / 4. 3. 7. 4	HELIUM INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 7. 4. 1. A / 4. 3. 7. 4. 1. A	Helium Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T	The FIR does not utilize the helium interface
3. 7. 4. 1. B / 4. 3. 7. 4. 1. B	Helium Interface Control	N/A	T	Certificate of Compliance.	L-3.5	T&A	The FIR does not utilize the helium interface
3. 7. 4. 2 / 4. 3. 7. 4. 2	Helium Interface MDP	N/A	T&A	Certificate of Compliance.	L-7.5	T&A	The FIR does not utilize the helium interface
3. 7. 4. 3 / 4. 3. 7. 4. 3	Helium Interface Temperature		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 7. 4. 4 / 4. 3. 7. 4. 4	Helium Leakage	N/A	T or T&A	Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided.	L-7.5	T or T&A	The FIR does not utilize the helium interface
3. 7. 4. 5 / 4. 3. 7. 4. 5	Helium Physical Interface		NVR	N/A	N/A	N/A	
3. 7. 5 / 4. 3. 7. 5	Pressurized Gas Systems	A	A	Data Cert providing maximum credible leak rate (in slpm) for each bottle.	L-7.5	A	
3. 7. 6 / 4. 3. 7. 6	Manual Valves	A	I	Certificate of Compliance.	L-3.5	I	
3. 8 / 4. 3. 8	PAYLOAD SUPPORT SERVICES INTERFACES REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 8. 1 / 4. 3. 8. 1	POTABLE WATER		TITLE	N/A	N/A	N/A	
3. 8. 1. 1 / 4. 3. 8. 1. 1	Potable Water Interface Connection		NVR	N/A	N/A	N/A	
3. 8. 1. 2 / 4. 3. 8. 1. 2	Potable Water Interface Pressure	N/A	T	Certificate of Compliance.	L-3.5	T	The FIR does not utilize the potable water interface

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 8. 1. 3. A / 4. 3. 8. 1. 3. A	Potable Water Use	N/A	A	Data Cert providing integrated rack water consumption analysis summary.	L-7.5	A	The FIR does not utilize the potable water interface
3. 8. 1. 3. B / 4. 3. 8. 1. 3. B	Potable Water Use	N/A	A	Data Cert providing integrated rack water consumption analysis summary.	L-7.5	A	The FIR does not utilize the potable water interface
3. 9 / 4. 3. 9	ENVIRONMENT INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 9. 1 / 4. 3. 9. 1	ATMOSPHERE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 9. 1. 1 / 4. 3. 9. 1. 1	Pressure	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3. 9. 1. 2 / 4. 3. 9. 1. 2	Temperature	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3. 9. 1. 3 / 4. 3. 9. 1. 3	Humidity	E	A	Analysis report including: - Description of condensation collection system. - Illustration of all components or surfaces where condensation is most likely to occur. - Upper humidity limit in terms of dewpoint. - All rack surface temperature	L-7.5	A	57218-NA-0012
3. 9. 2 / 4. 3. 9. 2	INTEGRATED RACK USE OF CABIN ATMOSPHERE		TITLE	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 9. 2. 1. A / 4. 3. 9. 2. 1. A	Active Air Exchange	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not exchange air with the cabin atmosphere
3. 9. 2. 1. B / 4. 3. 9. 2. 1. B	Active Air Exchange	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR is not aisle mounted
3. 9. 2. 2 / 4. 3. 9. 2. 2	Oxygen Consumption	A	A	Data Cert providing the integrated rack oxygen consumption analysis results.	L-7.5	A	
3. 9. 2. 3. A / 4. 3. 9. 2. 3. A	Chemical Releases	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3. 9. 2. 3. B / 4. 3. 9. 2. 3. B	Chemical Releases	A	A	Certificate of Compliance.	L-3.5	A	
3. 9. 3 / 4. 3. 9. 3	RADIATION REQUIREMENTS		TITLE	N/A	N/A	N/A	
3. 9. 3. 1 / 4. 3. 9. 3. 1	Integrated Rack Contained or Generated Ionizing Radiation	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3. 9. 3. 2 / 4. 3. 9. 3. 2	Ionizing Radiation Dose		NVR	N/A	N/A	N/A	
3. 9. 3. 3 / 4. 3. 9. 3. 3	Single Event Effect (SEE) Ionizing Radiation	A	A	Certificate of Compliance.	L-3.5	A	
3. 9. 3. 4 / 4. 3. 9. 3. 4	Lab Window Rack Location Radiation Requirements		NVR	N/A	N/A	N/A	
3. 9. 3. 4. 1 / 4. 3. 9. 3. 4. 1	Window Rack Infrared Radiation Requirements	N/A	T	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the lab window rack location

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3. 9. 3. 4. 2 / 4. 3. 9. 3. 4. 2	Window Rack Ultraviolet Radiation Requirements	N/A	T	Certificate of Compliance.	L-3.5	N/A	The FIR does not utilize the lab window rack location
3. 9. 4 / 4. 3. 9. 4	Additional Environmental Conditions		NVR	N/A	N/A	N/A	
3.10 / 4. 3.10	FIRE PROTECTION INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3.10. 1 / 4. 3.10. 1	Fire Prevention	A	Safety[2]	Certificate of Compliance	L-3.5	Safety[2]	
3.10. 2 / 4. 3.10. 2	Payload Monitoring and Detection Requirements	A	Safety[2]	Certificate of Compliance	L-3.5	Safety[2]	
3.10. 2. 1 / 4. 3.10. 2. 1	SMOKE DETECTION		TITLE	N/A	N/A	N/A	
3.10. 2. 1. 1. A / 4. 3.10. 2. 1. 1. A	Smoke Detector	A	I	COC for ISS provided smoke detectors or Analysis report for PD provided smoke detectors.	L-7.5	N/A	
3.10. 2. 1. 1. B / 4. 3.10. 2. 1. 1. B	Smoke Detector	A	I&D	Certificate of Compliance	L-3.5	N/A	
3.10. 2. 1. 2 / 4. 3.10. 2. 1. 2	Forced Air Circulation Indication	A	T	Certificate of Compliance for forced air circulation.	L-3.5	N/A	
3.10. 2. 1. 3. A / 4. 3.10. 2. 1. 3. A	Fire Detection Indicator	A	T&I	Drawing and a COC showing the size and location of the fire detection indicator.	L-7.5	N/A	
3.10. 2. 1. 3. B / 4. 3.10. 2. 1. 3. B	Fire Detection Indicator	A	I	Certificate of Compliance for fire detection indicators and sensors.	L-3.5	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.10. 2. 2 / 4. 3.10. 2. 2	PARAMETER MONITORING		TITLE	N/A	N/A	N/A	
3.10. 2. 2. 1 / 4. 3.10. 2. 2. 1	Parameter Monitoring Use	A	I&A	Certificate of Compliance	L-3.5	A&I	
3.10. 2. 2. 2 / 4. 3.10. 2. 2. 2	PARAMETER MONITORING RESPONSE		TITLE	N/A	N/A	N/A	
3.10. 2. 2. 2. 1. A / 4. 3.10. 2. 2. 2. 1. A	Parameter Monitoring in Subrack	A	T	Test report including test data.	L-7.5	N/A	
3.10. 2. 2. 2. 1. B / 4. 3.10. 2. 2. 2. 1. B	Parameter Monitoring in Subrack	A	T&A	Test report including test data.	L-7.5	T&A	
3.10. 2. 2. 2. 1. C / 4. 3.10. 2. 2. 2. 1. C	Parameter Monitoring in Subrack	A	T&A	Test report including test data.	L-7.5	T & A	
3.10. 2. 2. 2. 2. A / 4. 3.10. 2. 2. 2. 2. A	Parameter Monitoring in Integrated Rack	N/A	T	Test report including test data.	L-7.5	N/A	The FIR does not use parameter monitoring alone
3.10. 2. 2. 2. 2. B / 4. 3.10.2. 2. 2. 2. B	Parameter Monitoring in Integrated Rack	N/A	T	Test report including test data.	L-7.5	N/A	The FIR does not use parameter monitoring alone
3.10. 2. 2. 2. 2. C / 4. 3.10.2. 2. 2. 2. C	Parameter Monitoring in Integrated Rack	A	T&A	Test report including test data.	L-7.5	N/A	
3.10. 3 / 4. 3.10. 3	Fire Suppression		NVR	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.10. 3. 1. A / 4. 3.10. 3. 1. A	Portable Fire Extinguisher	A	I&A	1. Drawings showing the size and location of the fire suppression access port. 2. Certificate of Compliance	1. L-7.5 2. L-3.5	I &A	
3.10. 3. 1. B / 4. 3.10. 3. 1. B	Portable Fire Extinguisher	N/A	I&A	1. Drawings showing the size and location of the fire suppression access port. 2. Certificate of Compliance	1. L-7.5 2. L-3.5	I&A	The FIR panel thickness is not greater than 3.175 mm
3.10. 3. 2 / 4. 3.10. 3. 2	Fire Suppression Access Port Accessibility	A	D	Certificate of Compliance	L-3.5	D or A	
3.10. 3. 3 / 4. 3.10. 3. 3	Fire Suppressant Distribution	A	T	Certificate of Compliance	L-3.5	T or A	
3.10. 4. A / 4. 3.10. 4. A	Labeling	A	I	Certificate of Compliance	L-3.5	I	
3.10. 4. B / 4. 3.10. 4. B	Labeling	A	I	Drawing and a COC showing the size and location of the fire detection indicator.	L-7.5	N/A	
3.11 / 4. 3.11	MATERIALS AND PARTS INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3.11. 1 / 4. 3.11. 1	Materials and Parts Use and Selection	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.11. 2 / 4. 3.11. 2	FLUIDS		TITLE	N/A	N/A	N/A	
3.11. 2. 1. A. / 4. 3.11. 2. 1. A	Fluid Chemical Composition	A	T	Test report including test results.	L-3.5	T	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.11. 2. 1. B. / 4. 3.11. 2. 1. B	Fluid Chemical Composition	A	I&T	Certificate of Compliance.	L-3.5	I & T	
3.11. 2. 1. C. / 4. 3.11. 2. 1. C	Fluid Chemical Composition	N/A	I&T	Certificate of Compliance.	L-3.5	I & T	The FIR does not interface with the Argon fluid system
3.11. 2. 1. D. / 4. 3.11. 2. 1. D	Fluid Chemical Composition	N/A	I&T	Certificate of Compliance.	L-3.5	I & T	The FIR does not interface with the CO_2 fluid system
3.11. 2. 1. E. / 4. 3.11. 2. 1. E	Fluid Chemical Composition	N/A	I&T	Certificate of Compliance.	L-3.5	I & T	The FIR does not interface with the Helium fluid system
3.11. 2. 2. A. / 4. 3.11. 2. 2. A	Fluid System Cleanliness	A	I	Certificate of Compliance.	L-3.5	I	Note: Required data is provided by 3.11.2.1.A.
3.11. 2. 2. B. / 4. 3.11. 2. 2. B	Fluid System Cleanliness	A	I	Certificate of Compliance.	L-3.5	I	
3.11. 2. 2. C. / 4. 3.11. 2. 2. C	Fluid System Cleanliness	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not interface with the Argon fluid system
3.11. 2. 2. D. / 4. 3.11. 2. 2. D	Fluid System Cleanliness	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not interface with the CO_2 fluid system
3.11. 2. 2. E. / 4. 3.11. 2. 2. E	Fluid System Cleanliness	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not interface with the Helium fluid system
3.11. 2. 3. A. / 4. 3.11. 2. 3. A	Thermal Cooling System Wetted Materials	A	A	Certificate of Compliance.	L-3.5	A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.11. 2. 3. B. / 4. 3.11. 2. 3. B	Thermal Cooling System Wetted Materials	A	A	Certificate of Compliance.	L-3.5	A	
3.11. 2. 3. C. / 4. 3.11. 2. 3. C	Thermal Cooling System Wetted Materials	A	A or T	Certificate of Compliance.	L-3.5	A or T	
3.11. 3 / 4. 3.11. 3	Cleanliness	A	I	Certificate of Compliance.	L-3.5	I	
3.11. 4 / 4. 3.11. 4	Fungus Resistant Material	A	I	Certificate of Compliance.	L-3.5	I	
3.11. 5/ 4. 3.11. 5	Pyrotechnics		NVR	N/A	N/A	N/A	
3.12 / 4. 3.12	HUMAN FACTORS INTERFACE REQUIREMENTS		TITLE	N/A	N/A	N/A	
3.12. 1. A / 4. 3.12. 1. A	Strength Requirements	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 1. B / 4. 3.12. 1. B	Strength Requirements	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 2 / 4. 3.12. 2	BODY ENVELOPE AND REACH ACCESSIBILITY		TITLE	N/A	N/A	N/A	
3.12. 2. 1 / 4. 3.12. 2. 1	Adequate Clearance	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 2. 2. A / 4. 3.12. 2. 2. A	Accessibility	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 2. 2. B / 4. 3.12. 2. 2. B	Accessibility	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 2. 3 / 4. 3.12. 2. 3	Full Size Range Accommodation	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 3 / 4. 3.12. 3	HABITABILITY		TITLE	N/A	N/A	N/A	
3.12. 3. 1 / 4. 3.12. 3. 1	HOUSEKEEPING		TITLE	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 3. 1. 1 / 4. 3.12. 3. 1. 1	Closures and Covers	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 3. 1. 2. A / 4. 3.12. 3. 1. 2. A	Built-In Control	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 3. 1. 2. B / 4. 3.12. 3. 1. 2. B	Built-In Control	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 3. 1. 3 / 4. 3.12. 3. 1. 3	DELETED		N/A	N/A	N/A	N/A	
3.12. 3. 1. 4 / 4. 3.12. 3. 1. 4	DELETED		N/A	N/A	N/A	N/A	
3.12. 3. 1. 5 / 4. 3.12. 3. 1. 5	One-Handed Operation	A	D	Certificate of Compliance.	L-3.5	D	
3.12. 3. 2 / 4. 3.12. 3. 2	Touch Temperature		TITLE	N/A	N/A	N/A	
3.12. 3. 2. 1 / 4. 3.12. 3. 2. 1	Continuous/Incidental Contact - High Temperature	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 3. 2. 2 / 4. 3.12. 3. 2. 2	Continuous/Incidental Contact - Low Temperature	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 3.3 / 4. 3.12.3. 3	Acoustics Requirement		NVR	N/A	N/A	N/A	
3.12. 3. 3. 1. A / 4. 3.12. 3. 3. 1. A	Continuous Noise Limits - Subracks Not Changed Out	N/A	T	Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands	L-7.5	N/A	The FIR has subrack equipment which will be changed out

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 3. 3. 1. B / 4. 3.12. 3. 3. 1. B	Continuous Noise Limits - Subracks Changed Out	E	A*	Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands	L-7.5	A&T	*Test correlated analytical model or some other method approved and documented in the Acoustic Noise Control Plan.) 57218-NA-0017A
3.12. 3. 3. 1. C / 4. 3.12. 3. 3. 1. C	Continuous Noise Limits - Independently Operated Equipment	N/A	T	Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands	L-7.5	N/A	The FIR has no independently operated equipment
3.12. 3. 3. 1. D / 4. 3.12. 3. 3. 1. D	Continuous Noise Limits – Integrated Racks That Have Crew Operations Within the Rack Volume	N/A	T or A*	Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source – SPL (dB) for the eight octave bands	L-7.5	T or A*	The FIR Rack will not be occupied by the crewmember
3.12. 3. 3. 2. A / 4. 3.12. 3. 3. 2. A	Intermittent Noise Limits – Integrated Racks That Do Not Have Crew Operations Within the Rack Volume	A	A*	Acoustics summary that includes a list of potential noise sources and their locations. Intermittent Noise Source - Overall A-weighted SPL (dBA)	L-7.5	T or A*	*Test correlated analytical model or some other method approved and documented in the Acoustic Noise Control Plan.

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 3. 3. 2. B / 4. 3.12. 3. 3. 2. B	Intermittent Noise Limits – Integrated Racks That Have Crew Operations Within the Rack Volume	N/A	T or A*	Acoustics summary that includes a list of potential noise sources and their locations. Intermittent Noise Source - Overall A-weighted SPL (dBA)	L-7.5	T or A*	The FIR Rack will not be occupied by the crewmember
3.12. 3. 4. A / 4. 3.12. 3. 4. A	Lighting Design	A	I	Certificate of Compliance.	L-3.5	T or I	
3.12. 3. 4. B / 4. 3.12. 3. 4. B	Lighting Design	A	T	Certificate of Compliance.	L-3.5	T	
3.12. 3. 4. C / 4. 3.12. 3. 4. C	Lighting Design	N/A	D	Certificate of Compliance.	L-3.5	D	The FIR has no light sources
3.12. 3. 4. D / 4. 3.12. 3. 4. D	Lighting Design	A	D	Certificate of Compliance.	L-3.5	D	
3.12. 3. 4. E / 4. 3.12. 3. 4. E	DELETED		N/A	N/A	N/A	N/A	
3.12. 4 / 4. 3.12. 4	STRUCTURAL/MECHANICAL INTERFACES		TITLE	N/A	N/A	N/A	
3.12. 4. 1 / 4. 3.12. 4. 1	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 2 / 4. 3.12. 4. 2	PAYLOAD HARDWARE MOUNTING		TITLE	N/A	N/A	N/A	
3.12. 4. 2. 1 / 4. 3.12. 4. 2. 1	Equipment Mounting	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 4. 2. 2 / 4. 3.12. 4. 2. 2	Drawers and Hinged Panels	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 3 / 4. 3.12. 4. 2. 3	DELETED		N/A	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 4. 2. 4 / 4. 3.12. 4. 2. 4	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 2. 5 / 4. 3.12. 4. 2. 5	Alignment	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 6 / 4. 3.12. 4. 2. 6	Slide-out Stops	A	D	Certificate of Compliance.	L-3.5	A or D or I	
3.12. 4. 2. 7 / 4. 3.12. 4. 2. 7	Push-Pull Forces	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 8 / 4. 3.12. 4. 2. 8	Access	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 4. 2. 8. 1. A / 4. 3.12. 4. 2. 8. 1. A	Covers	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 8. 1. B / 4. 3.12. 4. 2. 8. 1. B	Covers	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 8. 2 / 4. 3.12. 4. 2. 8. 2	Self-Supporting Covers	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 2. 8. 3 / 4. 3.12. 4. 2. 8. 3	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 2. 8. 4 / 4. 3.12. 4. 2. 8. 4	Unique Tools	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3 / 4. 3.12. 4. 3	CONNECTORS		TITLE	N/A	N/A	N/A	
3.12. 4. 3. 1 / 4. 3.12. 4. 3. 1	One-Handed Operation	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 4. 3. 2. A1 / 4. 3.12. 4. 3. 2. A1	Accessibility	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 4. 3. 2. A2 / 4. 3.12. 4. 3. 2. A2	Accessibility	A	D	Certificate of Compliance.	L-3.5	A or D	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 4. 3. 2. B / 4. 3.12. 4. 3. 2. B	Accessibility	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3. 3. A / 4. 3.12. 4. 3. 3. A	Ease of Disconnect	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3. 3. B / 4. 3.12. 4. 3. 3. B	Ease of Disconnect	E	A	Certificate of Compliance.	L-3.5	A	57217-NA-0006A
3.12. 4. 3. 4 / 4. 3.12. 4. 3. 4	Indication of Pressure/Flow	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3. 5 / 4. 3.12. 4. 3. 5	Self Locking	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3. 6. A / 4. 3.12. 4. 3. 6. A	Connector Arrangement	E	I	Certificate of Compliance.	L-3.5	I	57218-NA-0003
3.12. 4. 3. 6. B / 4. 3.12. 4. 3. 6. B	Connector Arrangement	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 3. 7 / 4. 3.12. 4. 3. 7	Arc Containment	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 4. 3. 8 / 4. 3.12. 4. 3. 8	Connector Protection	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3. 9 / 4. 3.12. 4. 3. 9	Connector Shape	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3.10 / 4. 3.12. 4. 3.10	Fluid and Gas Line Connectors	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4.3.11 / 4. 3.12. 4. 3.11	Alignment Marks or Guide Pins	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4.3.12. A / 4. 3.12. 4. 3.12. A	DELETED		N/A	N/A	N/A	N/A	
3.12. 4.3.12. B / 4. 3.12.4.3.12. B	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 3.13 / 4. 3.12. 4. 3.13	Pin Identification	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
(65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 4. 3.14 / 4. 3.12. 4. 3.14	Orientation	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 3.15. A / 4. 3.12. 4. 3.15. A	Hose/Cable Restraints	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 3.15. B / 4. 3.12. 4. 3.15. B	Hose/Cable Restraints	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 3.15. C / 4. 3.12. 4. 3.15. C	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 3.15. D / 4. 3.12. 4. 3.15. D	Hose/Cable Restraints	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4 / 4. 3.12. 4. 4	FASTENERS		TITLE	N/A	N/A	N/A	
3.12. 4. 4. 1 / 4. 3.12. 4. 4. 1	Non-Threaded Fastener Status Indication	A	D	Certificate of Compliance.	L-3.5	I or D	
3.12. 4. 4. 2 / 4. 3.12. 4. 4. 2	Mounting Bolt/Fastener Spacing	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 3 / 4. 3.12. 4. 4. 3	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 4. 4 / 4. 3.12. 4. 4. 4	Multiple Fasteners	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 5 / 4. 3.12. 4. 4. 5	Captive Fasteners	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 4. 4. 6. A / 4. 3.12. 4. 4. 6. A	Quick Release Fasteners	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 6. B / 4. 3.12. 4. 4. 6. B	Quick Release Fasteners	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 7 / 4. 3.12. 4. 4. 7	Threaded Fasteners	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 8. A / 4. 3.12. 4. 4. 8. A	Over Center Latches - Nonself-latching	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 4. 4. 8. B / 4. 3.12. 4. 4. 8. B	Over Center Latches - Latch Lock	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 8. C / 4. 3.12. 4. 4. 8. C	Over Center Latches - Latch Handles	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4. 9 / 4. 3.12. 4. 4. 9	Winghead Fasteners	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4.10 / 4. 3.12. 4. 4.10	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 4.11. A / 4. 3.12. 4. 4.11. A	Fastener Head Type	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4.11. B / 4. 3.12. 4. 4.11. B	Fastener Head Type	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4.11. C / 4. 3.12. 4. 4.11. C	Fastener Head Type	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 4. 4.12 / 4. 3.12. 4. 4.12	One-Handed Actuation	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 4. 4.13 / 4. 3.12. 4. 4.13	DELETED		N/A	N/A	N/A	N/A	
3.12. 4. 4.14 / 4. 3.12. 4. 4.14	Access Holes	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5 / 4. 3.12. 5	CONTROLS AND DISPLAYS		TITLE	N/A	N/A	N/A	
3.12. 5. 1 / 4. 3.12. 5. 1	Controls Spacing Design Requirements	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2 / 4. 3.12. 5. 2	ACCIDENTAL ACTUATION		TITLE	N/A	N/A	N/A	
3.12. 5. 2. 1 / 4. 3.12. 5. 2. 1	Protective Methods	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2. 2 / 4. 3.12. 5. 2. 2	Noninterference	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 5. 2. 3 / 4. 3.12. 5. 2. 3	Dead-Man Controls	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 5. 2. 4 / 4. 3.12. 5. 2. 4	Barrier Guards	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2. 5 / 4. 3.12. 5. 2. 5	Recessed Switch Protection	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2. 6 / 4. 3.12. 5. 2. 6	DELETED		N/A	N/A	N/A	N/A	
3.12. 5. 2. 7 / 4. 3.12. 5. 2. 7	Position Indication	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2. 8 / 4. 3.12. 5. 2. 8	Hidden Controls	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 2. 9 / 4. 3.12. 5. 2. 9	Hand Controllers	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 3. A / 4. 3.12. 5. 3. A	Valve Controls - Low Torque Valves	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 3. B / 4. 3.12. 5. 3. B	Valve Controls - Intermediate Torque Valves	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 3. C / 4. 3.12. 5. 3. C	Valve Controls - High Torque Valves	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 3. D / 4. 3.12. 5. 3. D	Valve Controls - Handle Dimensions	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 3. E / 4. 3.12. 5. 3. E	Valve Controls - Rotary Valve Controls	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 5. 4 / 4. 3.12. 5. 4	Toggle Switches	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 6 / 4. 3.12. 6	Restraints and Mobility Aids	A	D	Certificate of Compliance.	L-3.5	A or D	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 6. 1. A / 4. 3.12. 6. 1. A	Stowage Drawer Contents Restraints	N/A	I&A	Certificate of Compliance.	L-3.5	I&A	The FIR does not have stowage drawers
3.12. 6. 1. B / 4. 3.12. 6. 1. B	Stowage Drawer Contents Restraints	N/A	D	Certificate of Compliance.	L-3.5	D	The FIR does not have stowage drawers
3.12. 6. 1. C / 4. 3.12. 6. 1. C	Stowage Drawer Contents Restraints	N/A	D	Certificate of Compliance.	L-3.5	D	The FIR does not have stowage drawers
3.12. 6. 2. A / 4. 3.12. 6. 2. A	Stowage and Equipment Drawers/Trays	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not have stowage drawers
3.12. 6. 2. B / 4. 3.12. 6. 2. B	Stowage and Equipment Drawers/Trays	N/A	I	Certificate of Compliance.	L-3.5	I	The FIR does not have stowage drawers
3.12. 6. 3 / 4. 3.12. 6. 3	Captive Parts	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 6. 4 / 4. 3.12. 6. 4	HANDLE AND GRASP AREA DESIGN REQUIREMENTS		TITLE	N/A	N/A	N/A	
3.12. 6. 4. 1 / 4. 3.12. 6. 4. 1	Handles and Restraints	A	D	Certificate of Compliance.	L-3.5	I or D	
3.12. 6. 4. 2 / 4. 3.12. 6. 4. 2	DELETED		N/A	N/A	N/A	N/A	
3.12. 6. 4. 3 / 4. 3.12. 6. 4. 3	Handle Location/Front Access	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 6. 4. 4 / 4. 3.12. 6. 4. 4	Handle Dimensions	A	D	Certificate of Compliance.	L-3.5	A or D	
3.12. 6. 4. 5. A / 4. 3.12. 6. 4. 5. A	Non-Fixed Handles Design Requirements	A	A&D	Certificate of Compliance.	L-3.5	A&D	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX
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IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 6. 4. 5. B / 4. 3.12. 6. 4. 5. B	Non-Fixed Handles Design Requirements	A	D	Certificate of Compliance.	L-3.5	D	
3.12. 6. 4. 5. C / 4. 3.12. 6. 4. 5. C	Non-Fixed Handles Design Requirements	A	I&D	Certificate of Compliance.	L-3.5	I&D	
3.12. 7 / 4. 3.12. 7	Identification Labeling	A	I	Certificate of Compliance showing Form 732 approval.	L-3.5	I	
3.12. 8 / 4. 3.12. 8	Color	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9 / 4. 3.12. 9	Crew Safety		TITLE	N/A	N/A	N/A	
3.12. 9. 1 / 4. 3.12. 9. 1	Electrical Hazards		N/A	N/A	N/A	N/A	
3.12. 9. 1. 1 / 4. 3.12. 9. 1. 1	Mismatched	A	A&I&D	Certificate of Compliance.	L-3.5	A&I&D	
3.12. 9. 1. 2 / 4. 3.12. 9. 1. 2	DELETED		N/A	N/A	N/A	N/A	
3.12. 9. 1. 3 / 4. 3.12. 9. 1. 3	DELETED		N/A	N/A	N/A	N/A	
3.12. 9. 1. 4 / 4. 3.12. 9. 1. 4	Overload Protection		NVR	N/A	N/A	N/A	
3.12. 9. 1. 4. 1 / 4. 3.12. 9. 1. 4. 1	Device Accessibility	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9. 1. 4. 2 / 4. 3.12. 9. 1. 4. 2	Extractor-Type Fuse Holder	A	D	Certificate of Compliance.	L-3.5	D	
3.12. 9. 1. 4. 3 / 4. 3.12. 9. 1. 4. 3	Overload Protection Location	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9. 1. 4. 4 / 4. 3.12. 9. 1. 4. 4	Overload Protection Identification	A	I	Certificate of Compliance.	L-3.5	I	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 9. 1. 4. 5 / 4. 3.12. 9. 1. 4. 5	Automatic Restart Protection	A	D	Certificate of Compliance.	L-3.5	D	
3.12. 9. 1. 5 / 4. 3.12. 9. 1. 5	DELETED		N/A	N/A	N/A	N/A	
3.12. 9. 1. 5. 1 / 4. 3.12. 9. 1. 5. 1	DELETED		N/A	N/A	N/A	N/A	
3.12. 9. 2 / 4. 3.12. 9. 2	Sharp Edges and Corners Protection	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 9. 3 / 4. 3.12. 9. 3	Holes	A	A&I	Certificate of Compliance.	L-3.5	A&I	
3.12. 9. 4 / 4. 3.12. 9. 4	Latches	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9. 5 / 4. 3.12. 9. 5	Screws and Bolts	A	A&I	Certificate of Compliance.	L-3.5	A&I	
3.12. 9. 6 / 4. 3.12. 9. 6	Securing Pins	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 9. 7 / 4. 3.12. 9. 7	Levers, Cranks, Hooks, and Controls	A	A&I	Certificate of Compliance.	L-3.5	A&I	
3.12. 9. 8 / 4. 3.12. 9. 8	Burrs	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9. 9. A / 4. 3.12. 9. 9. A	Locking Wires	A	A	Certificate of Compliance.	L-3.5	A	
3.12. 9. 9. B / 4. 3.12. 9. 9. B	Locking Wires	A	I	Certificate of Compliance.	L-3.5	I	
3.12. 9.10. A / 4. 3.12. 9.10. A	Audio Device Displays	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize audio devices
3.12. 9.10. B / 4. 3.12. 9.10. B	DELETED		N/A	N/A	N/A	N/A	

TABLE 4.2-1 APPLICABILITY / VERIFICATION MATRIX (65 PAGES)

IRD Number	IRD Requirement	Payload Appli-cability	Verification Method	Required Submittal Data	Submittal Date (L-X mos)	Subrack P/L Changeout Verification Method	Comments
3.12. 9.10. C / 4. 3.12. 9.10. C	Audio Device Displays	N/A	D	Certificate of Compliance.	L-3.5	D	The FIR does not utilize audio devices
3.12. 9.10. D / 4. 3.12. 9.10. D	Audio Device Displays	N/A	A	Certificate of Compliance.	L-3.5	A	The FIR does not utilize audio devices
3.12. 9.11 / 4. 3.12. 9.11	DELETED		N/A	N/A	N/A	N/A	
3.12. 9.12 / 4. 3.12. 9.12	Egress	A	Safety[2]	Certificate of Compliance.	L-3.5	Safety[2]	
3.12. 9.13 / 4. 3.12. 9.13	Lasers		NVR	N/A	N/A	N/A	
3.12. 9.14 / 4. 3.12. 9.14	Optical Equipment and Instruments		NVR	N/A	N/A	N/A	
3.12.10 / 4. 3.12.10	Payload In-Flight Maintenance	A	A	Certificate of Compliance.	L-3.5	A	

Note 1: Integrated racks with on-orbit configuration changes will require re-verification by the rack integrator for MPLM descent.
Note 2: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.
Note 3: The requirements that comprise this applicability matrix are based on Revision F of SSP 57001 and Revision H of SSP 57000.

TABLE 4.2-2 SSP 57000 APPLICABILITY/VERIFICATION MATRIX FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)

IRD Number	IRD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date L-X mos	Comments
3. 1. 1. 2. B / 4. 3. 1. 1. 2. B	MPLM Interfaces	A	A	Certificate of Compliance.	L−3.5	
3. 1. 1. 2. 1 / 4. 3. 1. 1. 2. 1	MPLM Late Access Requirements	N/A	T	Certificate of Compliance.	L−3.5	No Late Access
3. 1. 1. 2. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. A	MPLM Late Access Envelope (KSC)	N/A	I	Certificate of Compliance.	L−3.5	No Late Access
3. 1. 1. 2. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. B	MPLM Late Access Envelope (KSC)	N/A	I	Certificate of Compliance.	L−3.5	No Late Access
3. 1. 1. 2. 1. 1. C / 4. 3. 1. 1. 2. 1. 1. C	MPLM Late Access Envelope (KSC)	N/A	I	Certificate of Compliance.	L−3.5	No Late Access
3. 1. 1. 3. A / 4. 3. 1. 1. 3. A	Loads Requirements	N/A	A (Note 1)	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L−7.5 2. L−5	Equipment is launched outside of the rack and soft-stowed
3. 1. 1. 3. D / 4. 3. 1. 1. 3. D	Loads Requirements	A	A	Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1 showing positive margins of safety	L−7.5	
3. 1. 1. 3. F / 4. 3. 1. 1. 3. F	Loads Requirements	A	A	1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis.	1. L−7.5 2. L−5	Closed by reference of soft-stow memo ES2-02-049

TABLE 4.2-2 SSP 57000 APPLICABILITY/VERIFICATION MATRIX FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)

IRD Number	IRD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date L-X mos	Comments
3. 2. 4. 4 / 4. 3. 2. 4. 4	Electromagnetic Interference	A	T&A	1. Test Report 2. Analysis report for the integrated rack based on sub-rack and/or rack equipment test data.	1. L−7.5 2. L−7.5	RE02 only Closed by integrated rack verification data[4]
3. 2. 4. 9 / 4. 3. 2. 4. 9	Lightning	A	A	Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1.	L−7.5	TIA #958c
3. 7. 5 / 4. 3. 7. 5	Pressurized Gas Systems	A	A	Data Cert providing maximum credible leak rate (in slpm) for each bottle.	L−7.5	
3. 9. 1. 1 / 4. 3. 9. 1. 1	Pressure	A	Safety (Note 2)	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3. 9. 1. 2 / 4. 3. 9. 1. 2	Temperature	A	Safety (Note 2)	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3. 9. 1. 3 / 4. 3. 9. 1. 3	Humidity	A	A	Analysis report including: − Description of condensation collection system. − Illustration of all components or surfaces where condensation is most likely to occur. − Upper humidity limit in terms of dewpoint. − All rack surface temperature	L−7.5	Closed by integrated rack verification data[4]
3. 9. 2. 3. A / 4. 3. 9. 2. 3. A	Chemical Releases	A	Safety (Note 2)	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3. 9. 2. 3. B / 4. 3. 9. 2. 3. B	Chemical Releases	A	A	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3. 9. 3. 1 / 4. 3. 9. 3. 1	Integrated Rack Contained or Generated Ionizing Radiation	A	Safety (Note 2)	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]

TABLE 4.2-2 SSP 57000 APPLICABILITY/VERIFICATION MATRIX FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)

IRD Number	IRD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date L-X mos	Comments
3. 9. 3. 3 / 4. 3. 9. 3. 3	Single Event Effect (SEE) Ionizing Radiation	A	A	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3.11. 1 / 4. 3. 11. 1	Materials and Parts Use and Selection	A	Safety (Note 2)	Certificate of Compliance.	L−3.5	Closed by integrated rack verification data[4]
3.11. 3 / 4. 3.11. 3	Cleanliness	A	I	Certificate of Compliance. (Note 3)	L−3.5	
3.12. 1. A / 4. 3.12. 1. A	Strength Requirements	A	A or D	Certificate of Compliance. (Note 3)	L−3.5	Closed by integrated rack verification data[4]
3.12. 9. 2 / 4. 3.12. 9. 2	Sharp Edges and Corners Protection	A	Safety (Note 2)	Certificate of Compliance. (Note 3)	L−3.5	
3.12. 9. 8 / 4. 3.12. 9. 8	Burrs	A	I	Certificate of Compliance. (Note 3)	L−3.5	

Note 1: Integrated racks with on-orbit configuration changes will require re-verification by the rack integrator for MPLM descent.
Note 2: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.
Note 3: Requirement may be closed by submittal of pre-launch verification
Note 4: The PACE experiment will need to address the launch requirements in table 4.2-2 separately from the integrated rack verification data.

TABLE 4.2-3 HTV APPLICABILITY/VERIFICATION MATRIX (2 PAGES)

Requirement Paragraph	HTV Requirement	Payload Applicability	Verifi-cation Method	Required Submittal Data	Submittal Date (L-X mos)	Comments
N.3.0	Requirements		NVR			
N.3.1	General		NVR			
N.3.1.1	Definition of Soft-stowed Cargo		NVR			
N.3.1.2	Coordinate System		NVR			
N.3.2	Interface Requirements		NVR			
N.3.2.1	Soft-Stowed Payload Envelope Requirements	A	I	CoC	L-6.5	
N.3.2.2	Soft-Stowed Payload Mass Properties	A	T	CoC	L-6.5	
N.3.2.3	Structural and Mechanical		NVR			
N.3.2.4	Induced Environments		NVR			
N.3.2.4.1	Vibro-acoustic		NVR			
N.3.2.4.1.1	Launch Acoustics		NVR			
N.3.2.4.1.2	Random Vibration for Soft-Stowed Payloads	A	A	Data Cert providing a summary of the margins of safety using design loads.	L-7.5	
N.3.2.4.2	Sinusoidal Vibration		NVR			
N.3.2.4.3	Shock		NVR			
N.3.2.4.4	Acceleration	A	A	Data Cert providing a summary of the margins of safety using design loads.	L-7.5	
N.3.2.4.5	Thermal Environments	A	A	CoC	L-6.5	
N.3.2.4.6	Interface Loads		NVR			
N.3.2.4.7	Load Spectrum		NVR			
N.3.2.4.7.1	H-IIB Launch load spectrum for HTV		NVR			
N.3.2.4.7.2	On-orbit load spectrum		NVR			
N.3.2.4.8	Pressure Environments	A	A	CoC	L-6.5	Equivalent requirement for Depress/Repress portion: SSP 52000 Requirement 4.8.3.A or SSP 57000 Requirement 3.1.1.2.B and 3.1.1.4.B

TABLE 4.2-3 HTV APPLICABILITY/VERIFICATION MATRIX (2 PAGES)

Requirement Paragraph	HTV Requirement	Payload Applicability	Verifi-cation Method	Required Submittal Data	Submittal Date (L-X mos)	Comments
N.3.2.4.9	Humidity	A	A	CoC	L-6.5	
N.3.2.5	Cargo Service	A	A	CoC	L-6.5	
N.3.2.6.	Late Access		NVR			
N.3.2.6.1	Late Access Dimensions	N/A	T	CoC	L-6.5	No Late Access
N.3.2.6.2	Late Access Mass Limits	N/A	T	CoC	L-6.5	No Late Access
N.3.2.7	Safety Requirements	A	Safety[1]	CoC	L-6.5	
N.3.2.8	Electrical Interface		NVR			
N.3.2.9	Thermal Interface		NVR			
N.3.2.10	Restrains and Mobility Aids Hardware Interface		NVR			
N.3.2.11	Criteria of Fluid Leak		NVR			
N.3.2.11.1	Fluid Leak Failure Tolerance	N/A	I	CoC	L-6.5	No Fluids
N.3.2.11.2	Fluid Leak Rate	N/A	A or I	Data Cert providing maximum credible leak rate (in SLPM)	L-7.5	No Fluids
N.3.2.11.3	Total Fluid Leak	N/A	A	Data Cert providing the maximum total gross weight of fluid	L-7.5	No Fluids
N.3.2.12	Off Gassing	A	T and A	CoC	L-6.5	Equivalent requirement: SSP 52000 Requirement 13.1.4
N.3.2.13	Materials and Processes		NVR			
N.3.2.13.1	Materials and Processes Approval	A	I	CoC	L-6.5	Equivalent requirement: SSP52000 Requirement 13.1, or 57000 Requirement 3.11.1
N.3.2.13.2	Control of water soluble Volatile Organic Compounds	N/A	A	CoC	L-6.5	No volatile organic compounds
N.3.2.14	Cleanliness	A	I	CoC	L-6.5	

Notes:
1) Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
3. 4. 2 / ME-ER-002	Standard Modular Locker	N/A	I	COC	L-4.5	Responsibility of MO and Stowage CCCD process. Payload is under 30 lbm and is less than the size of 1 CTB.
3. 4. 2. 3. A / HF-ER-037	Payload Zero-G Requirements	N/A	A & I	COC	L-4.5	Stowage configuration controlled by CCCD.
3. 4. 2. 4 / ME-ER-002	Isolation Material Properties	N/A	A	COC	L-4.5	Stowage configuration controlled by CCCD.
3. 4. 5. 1 / ST-ER-009	Fracture-Critical Threaded Fasteners	N/A	I	COC	L-4.5	Stowed Hardware does not use Fracture-Critical Threaded Fasteners
3. 6. 3 / HF-ER-035	Sharp Edges and Corners	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.2
3. 6. 3. 2 / HF-ER-035	Holes	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.3
3. 6. 3. 3 / HF-ER-035	Screws / Bolts Ends	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.5
3. 6. 3. 4 / HF-ER-035	Burrs	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.8
3. 6. 3. 5 / HF-ER-035	Latches	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.4
3. 6. 3. 6 / HF-ER-035	Levers, Cranks, Hooks, and Controls	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.7
3. 6. 3. 7 / HF-ER-035	Safety/Lockwire	A	I	COC	L-4.5	SSP 57000 Requirements: 3.12.9.9

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
3. 6. 3. 8 / HF-ER-035	Securing Pins	A	I or A	COC	L-4.5	SSP 57000 Requirements: 3.12.9.6
3. 8 / HF-ER-034	IVA Transfer Pathway	A	I	Data Certification (update) providing drawings identifying any new protrusions or changes to previous data certification.	L-9	
3. 9 / ME-MD-003	Orbiter Overhead Window Interface	N/A	I	COC	L-4.5	No interface to the overhead window
4. 1. 1. 2 / ST-ER-004	Middeck Payload Frequency Compatibility	N/A	A or A & T	COC	L-4.5	Payload equipment is not hard mounted during launch
4. 1. 2. 2 / ST-ER-001	Middeck Low Frequency Launch and Landing Loads	A	A or A & T	Data Certification that provides a summary of the margins of safety and analysis load factors for all SCS identified in accordance with SSP 52005.	L-12	Covered by reference of the Soft-Stow Memo ES2-02-049
4. 1. 2. 4 / ST-ER-001	Middeck Low Frequency On-Orbit Loads	N/A	A or A & T	Data Certification that provides a summary of the margins of safety and analysis load factors for all SCS identified in accordance with SSP 52005.	L-12	Hardware remains stowed while in Middeck
4. 1. 3. 2. A / ST-ER-001	Middeck Factors of Safety	A	A or A & T	Data Certification that provides a summary of the margins of safety and analysis load factors for all SCS identified in accordance with SSP 52005.	L-12	

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
4. 1. 3. 2. B / ST-ER-001	Middeck Factors of Safety	A	A or A & T	Data Certification that provides a summary of the margins of safety and analysis load factors for all SCS identified in accordance with SSP 52005.	L-12	
4. 1. 3. 2. C / ST-ER-001	Middeck Factors of Safety	A	A or A & T	Data Certification that provides a summary of the margins of safety and analysis load factors for all SCS identified in accordance with SSP 52005.	L-12	
4. 2. 1 / ST-ER-001 and ST-ER-010	Middeck Emergency Landing Load Factors	N/A	1. A or A&T 2. A and/or T	Data Certification with summary of margins of safety and analysis load factors for all SCS as identified in accordance with 52005.	1. L-12 2. L-11.5	Non-safety critical hardware is contained and will not create a hazard.
4. 4. 1 / ST-ER-011	Single MDL Location Mass Properties Limits	N/A	T	Certified weight and balance report for each payload element and mass properties compliance assessment.	L-12	Responsibility of MO and Stowage CCCD process. Payload is under 30 lbm and is less than the size of 1 CTB.
4. 4. 2 / ST-ER-011	Double MDL Location Mass Properties Limits	N/A	T	Certified weight and balance report for each payload element and mass properties compliance assessment.	L-12	Responsibility of MO and Stowage CCCD process. Payload is under 30 lbm and is less than the size of 1 CTB.

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
4. 5. 1 / ST-ER-002 and ST-MD-003	Crew-Induced Loading	A	1. A 2. A	1. Data Certification providing a summary listing of all operational modes analyzed and a summary of the margins of safety 2. COC	1. L-12 2. L-4.5	SSP 57000 Requirements: 3.1.1.3.D
4. 6. 2 / ST-ER-008	Fracture Control	A	A & I	Data Certification providing a fracture control summary report (submitted to the PSRP during the Phase 3 Flight Safety Review).	L-11.5	SSP 57000 Requirements: 3.1.1.5
4. 7. 1 / ST-ER-001	Lift-Off and Ascent Acoustics	N/A	A or A & T	1. Data Certification with summary of margins of safety and analysis load factors for all SCS as identified in accordance with 52005. 2. COC	1. L-12 2. L-4.5	Soft stowed hardware is not a large surface area low density structure that is susceptible to acoustic loads.
4. 8. 3. A / ST-ER-003	Middeck Maximum Depressurization / Repressurization Rates	A	A or A & T	COC	L-4.5	
4. 8. 3. B / ST-ER-003	Middeck Maximum Depressurization / Repressurization Rates	A	A or A&T	COC	L-4.5	

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
5. 1. 2. 1. B / TH-ER-002	Condensation Prevention	N/A	A	Thermal analysis report to support rack/Middeck level condensation analysis including, when appropriate: • Description of condensation collection system. • Illustration of all components or surfaces where condensation is most likely to occur when the cabin environment exceeds the nominal case. • Upper humidity limit in terms of dewpoint. • All payload surface temperatures.	L-11	Components are passive and have no cold surfaces during transport.
5. 2 / TH-ER-005	Environmental Conditions	A	A &/or T	COC [1]	5.2 / TH-ER-005	
7. 2. 2. D / EL-MD-004	Radiated Interference	A	A	COC	L-6.5	See TIA 958C
10. 1. A / MP-ER-001	Payload Equipment Surface Cleanliness	A	I & A	COC	L-4.5	SSP 57000 Requirements: 3.11.3
10. 1. B / MP-ER-001	Payload Equipment Surface Cleanliness	A	I & A	COC	L-4.5	SSP 57000 Requirements: 3.11.3

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
10. 5. 2. A / EN-ER-004	Chemical Releases	A	A	1.COC	L-4.5	SSP 57000 Requirements: 3.9.2.3.A
10. 5. 2. C / EN-ER-004	Chemical Releases	A	A	COC	L-4.5	
10. 5. 2. D / EN-ER-004	Chemical Releases	A	A	COC	L-4.5	
13. 1 / MP-ER-001	Materials and Processes Use and Selection	A	T&A&I	1. COC 2. Analysis and Test reports to support rack level analysis of nominal/planned release of materials. 3. Analysis and drawings to support rack-level analysis of flammability.	1. L-4.5 2. L-7.0 3. L-7.0	
13. 1. 2 / MP-ER-001	Hazardous Materials and Compatibility	A	A or T	Analysis and test reports to support rack level analysis of nominal/planned release of materials.	L-7.0	
13. 1. 3 / MP-ER-001	Test and Acceptance Criteria for Flammability	A	I	Analysis and drawings to support rack-level analysis of flammability.	L-7.0	
13. 1. 4 / MP-ER-001	Test and Acceptance Criteria for Toxic Offgassing (Toxicity)	A	T	Analysis and test reports to support rack level analysis of nominal/planned release of materials.	L-7.0	

TABLE 4.2-4 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR MIDDECK TRANSPORT (MIDDECK NON-POWERED PASSIVE STOWED) BASED ON SSP 52000 REVISION G REQUIREMENTS AS SPECIFIED IN SSP 57008 REVISION A, APPENDIX H (7 PAGES)

52000 IDD Number / VRDS Cross-Reference	IDD Requirement	Payload Applicability	Verification Method	Verification Data Submittal	Required Submittal Date	Comments
14. 1. 1 / MP-ER-001	Flammability Requirements	A	I	Analysis and drawings to support rack-level analysis of flammability	L-7.0	

Notes:
The requirements in this matrix are written per SSP 52000-IDD-ERP, Rev G.
1. The maximum temperature range identified for Middeck structure is 48.9°C, while SSP 57000, Requirement 3.9.1.2, identifies a maximum range of 46°C.
2. SSP 57000, Requirement 3.5.1.12, does not address the maximum allowable heat dissipation of 60 W per locker-size payload in the Middeck.

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 1. 1/ 4. 3. 1. 1	Structures/ Mechanisms	A	T[2]	Test Report	L-7.5	Text Substitution #1.Equivalent to SSP 57000, 3.1.1.5.
3. 1. 1. 2. 1. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. 1. A	Acceleration Force Loads for Pre-Defined End Item Orientation	A	A	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 have specific orientation requirements during launch. All other items have an undefined orientation. Text Substitution #2
3. 1. 1. 2. 1. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. 1. B	Acceleration Force Loads for Pre-Defined End Item Orientation	A	A	Data Cert providing a summary of the margins of safety using design loads	L-7.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 have specific orientation requirements during launch. All other items have an undefined orientation. Text Substitution #2
3. 1. 1. 2. 1. 1. 2. A / 4. 3. 1. 1. 2. 1. 1. 2. A	Acceleration Force Loads for Undefined End Item Orientation	A	A	CoC	L-6.5	Text Substitution #2

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 1. 1. 2. 1. 1. 2. B / 4. 3. 1. 1. 2. 1. 1. 2. B	Acceleration Force Loads for Undefined End Item Orientation	A	A	Data Cert providing a summary of the margins of safety using design loads	L-7.5	Text Substitution #2
3. 1. 1. 2. 1. 2. 3/ 4. 3. 1. 1. 2. 1. 2. 3	Random Vibration Requirements for foam packed end items	A	T[2]	Test Report	L-7.5	Text Substitution #3
3. 1. 1. 2. 1. 3/ 4. 3. 1. 1. 2. 1. 3	Acoustic Environments	A	A or T	Test Report	L-7.5	Text Substitution #3 N/A for the PACE Oil Dispenser - Does not have a low mass density and large surface area
3. 1. 1. 2. 1. 4. 3/ 4. 3. 1. 1. 2. 1. 4. 3	Shock Environments for Foam Packed Items	A	T[2]	Test Report	L-7.5	Text Substitution #3
3. 1. 1. 2. 1. 5. B/ 4. 3. 1. 1. 2. 1. 5. B	Pressure Loading	A	A	CoC	L-6.5	Text Substitution #2
3. 1. 1. 2. 2. 4. C/ 4. 3. 1. 1. 2. 2. 4. C	European ATV	A	T[2]	Test Report	L-7.5	Text Substitution #4
3. 1. 1. 2. 2. 5. B/ 4. 3. 1. 1. 2. 2. 5. B	Japanese HTV	N/A	A	Fatigue Analysis Report showing the integrated end item will retain sufficient life after being subjected to the HTV launch load spectrum.	L-7.5	Not a fracture critical payload
3. 1. 1. 3. A/ 4. 3. 1. 1. 3. A	On-Orbit Environments	A	A	Data Cert providing a margin of safety summary in accordance with SSP 52005.	L-7.5	Equivalent to SSP 57000 3.1.1.3.B and 52000 4.5.2.
3. 1. 1. 3. B/ 4. 3. 1. 1. 3. B	On-Orbit Environments	A	A	Data Cert providing a summary of the positive margins of safety	L-7.5	

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 1. 1. 3. C/ 4. 3. 1. 1. 3. C	On-Orbit Environments	A	A	Data Cert providing a summary of the positive margins of safety	L-7.5	
3. 1. 1. 3. D/ 4. 3. 1. 1. 3. D	On-Orbit Environments	A	A	Data Cert providing a summary of the positive margins of safety	L-7.5	
3. 1. 1. 3. E/ 4. 3. 1. 1. 3. E	On-Orbit Environments	A	A	Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1, showing positive margins of safety.	L-7.5	Equivalent to SSP 57000 3.1.1.3.D and 52000 4.5.1
3. 1. 4. 1. 1/ 4. 3. 1. 4. 1. 1	MPLM Late Access Weight	A	T	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 require late stowage. All other items have no late access.
3. 1. 4. 1. 2. A/ 4. 3. 1. 4. 1. 2. A	MPLM Late Access Envelope	A	I	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 require late stowage. All other items have no late access.

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 1. 4. 1. 2. B/ 4. 3. 1. 4. 1. 2. B	MPLM Late Access Envelope	A	I	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 require late stowage. All other items have no late access.
3. 1. 4. 1. 2. C/ 4. 3. 1. 4. 1. 2. C	MPLM Late Access Envelope	A	I	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 require late stowage. All other items have no late access.
3. 1. 4. 5/ 4. 3. 1. 4. 5	H-IIB Transfer Vehicle	A	D	CoC	L-6.5	LMM-BIO Worm Kit P/N: S1051MFA0030 and LMM-BIO Liver Tissue Kit, P/N: S1051MFA0050 require late stowage. All other items have no late access.
3. 1. 7/ 4. 3. 1. 7	Cargo Dimensions		NVR			
3. 1. 8/ 4. 3. 1. 8	Reserved		NVR			

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 2. 4. 5/ 4. 3. 2. 4. 5	Electrostatic Discharge	A	T or A&I	1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling.	L-7.5 L-7.5	Equivalent to SSP 57000 3.2.4.5 N/A for LMM BIO Lenses[3] and PACE Oil Dispenser– No EPCE.
3. 2. 4. 7. 2/ 4. 3. 2. 4. 7. 2	DC Magnetic Fields for Russian Launch Vehicles	A	T	Test Report	L-7.5	N/A for LMM BIO Lenses[3] and PACE Oil Dispenser – No Magnets
3. 2. 4. 9/ 4. 3. 2. 4. 9	Lightning	A	A	Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1.	L-7.5	Note: For closure rationale see Electromagnetic Effects (EME) Panel TIA #958c Equivalent to SSP 57000 3.2.4.9. N/A for LMM BIO Lenses[3] and PACE Oil Dispenser– TIA #958c, Scenario #1: Non-Electrical Hardware.
3. 2. 9. A/ 4. 3. 2. 9. A	Batteries	A	Safety[1]	CoC	L-6.5	N/A for LMM BIO Lenses[3] and PACE Oil Dispenser– No Batteries
3. 7. 6/ 4. 3. 7. 6	Pressurized Gas Systems	N/A	A	Data Cert providing maximum credible leak rate (in slpm) for each bottle.	L-7.5	No pressurized gas system
3. 9. 1. 1. A/ 4. 3. 9. 1. 1. A	Pressure	A	A	CoC	L-6.5	Text Substitution #2 and Text Substitution #5

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3. 9. 1. 2. B/ 4. 3. 9. 1. 2. B	Temperature	A	Safety[1]	CoC	L-6.5	
3. 9. 1. 2. D/ 4. 3. 9. 1. 2. D	Temperature	A	Safety[1]	CoC	L-6.5	
3. 9. 1. 3. A/ 4. 3. 9. 1. 3. A	Humidity	A	A	CoC	L-6.5	Text Substitution #2 and Text Substitution #5
3. 9. 1. 3. D/ 4. 3. 9. 1. 3. D	Humidity	A	A	CoC	L-6.5	
3. 9. 2. 3. A/ 4. 3. 9. 2. 3. A	Chemical Releases	A	Safety[1]	CoC	L-6.5	Text Substitution #6 Equivalent to SSP 57000 3.9.2.3.A and 52000 10.5.2.A with the substitution. N/A for LMM BIO Lenses[3] – No Chemicals
3. 9. 2. 3. B/ 4. 3. 9. 2. 3. B	Chemical Releases	A	A	CoC	L-6.5	Equivalent to SSP 57000 3.9.2.3.B and 52000 10.5.2.B N/A for LMM BIO Lenses[3] and PACE Oil Dispenser– No Volatile Organics
3. 9. 3. 2/ 4. 3. 9. 3. 2	Ionizing Radiation Dose	A	A	CoC	L-6.5	Text Substitution #7 Equivalent to SSP 57000 3.9.3.2
3.10. 5. A/ 4. 3.10. 5. A	Labeling	N/A	I	CoC	L-6.5	No PFE Access Port

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3.10. 5. B/ 4. 3.10. 5. B	Labeling	N/A	I	Drawing and a COC showing the size and location of the fire detection indicator.	L-7.5	No Fire Detection LED
3.11. 1/ 4. 3.11. 1	Materials and Processes Use and Selection	A	I	CoC	L-6.5	Equivalent to SSP 57000 3.11.1 and to a combination of the following 52000 requirements: 13.1, 13.1.2, 13.1.3, 13.1.4, and 14.1.1
3.11. 3/ 4. 3.11. 3	Cleanliness	A	I	CoC	L-6.5	Equivalent to 57000 3.11.3 and to 52000 10.1.B
3.12. 1. A / 4. 3.12. 1. A	Strength Requirements	A	A or D	CoC	L-6.5	Equivalent to SSP 57000 3.12.1.A
3.12. 3. 1. 3 / 4. 3.12. 3. 1. 3	One-Handed Operation	A	D	CoC	L-6.5	Equivalent to SSP 57000 3.12.3.1.5
3.12. 3. 2. 1. A / 4. 3.12. 3. 2. 1. A	Continuous/Incidental Contact - High Temperature	N/A	Safety[1]	CoC	L-6.5	No heating source
3.12. 3. 2. 2. A / 4. 3.12. 3. 2. 2. A	Continuous/Incidental Contact - Low Temperature	N/A	Safety[1]	CoC	L-6.5	No cooling source
3.12. 4. 3. 8 / 4. 3.12. 4. 3. 8	Connector Protection	A	A	CoC	L-6.5	Equivalent to SSP 57000 3.12.4.3.8 N/A for LMM BIO Lenses[3] and PACE Oil Dispenser – No Connectors
3.12. 6. 3 / 4. 3.12. 6. 3	Captive Parts	A	I	CoC	L-6.5	Equivalent to SSP 57000 3.12.6.3

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments
3.12. 6. 4. 1 / 4. 3.12. 6. 4. 1	Handles and Restraints	N/A	I or D	CoC	L-6.5	Items less than 1 cubic foot
3.12. 6. 4. 3 / 4. 3.12. 6. 4. 3	Handle Location/Front Access	N/A	I	CoC	L-6.5	Items less than 1 cubic foot
3.12. 6. 4. 4 / 4. 3.12. 6. 4. 4	Handle Dimensions	N/A	A or D	CoC	L-6.5	Items less than 1 cubic foot
3.12. 6. 4. 5. A / 4. 3.12. 6. 4. 5. A	Non-Fixed Handles Design Requirements	N/A	A&D	CoC	L-6.5	Items less than 1 cubic foot
3.12. 6. 4. 5. B / 4. 3.12. 6. 4. 5. B	Non-Fixed Handles Design Requirements	N/A	D	CoC	L-6.5	Items less than 1 cubic foot
3.12. 6. 4. 5. C / 4. 3.12. 6. 4. 5. C	Non-Fixed Handles Design Requirements	N/A	I&D	CoC	L-6.5	Items less than 1 cubic foot
3.12. 9. 2 / 4. 3.12. 9. 2	Sharp Edges and Corners Protection	A	Safety[1]	CoC	L-6.5	Text Substitution #6. Equivalent to SSP 57000 3.12.9.2 and 52000 3.6.3
3.12. 9. 8 / 4. 3.12. 9. 8	Burrs	A	I	CoC	L-6.5	Equivalent to SSP 57000 3.12.9.8 and 52000 3.6.3.4
3.12. 9. 9. A / 4. 3.12. 9. 9. A	Locking Wires	N/A	A	CoC	L-6.5	No locking wires
3.12. 9. 9. B / 4. 3.12. 9. 9. B	Locking Wires	N/A	I	CoC	L-6.5	No locking wires

Note: The requirements in this matrix are written per SSP 50835, Revision A.
Note 1: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report by the PSRP.
Note 2: This verification may be considered successful when the payload developer submits a Certificate of Compliance stating the hardware has no safety-critical structures (as defined in SSP 52005) and the payload developer accepts the risk to mission success of not performing the test.
Note 3: The LMM BIO Lenses will use the Common Launch requirements in Table 4.2-5 as the Launch interface requirements. The LMM BIO Lenses include the following: LMM 10x Lens, P/N: 67215MFLA11035; LMM 20x Lens, P/N: 67215MFLA11036; LMM 50x Lens, P/N: 67215MFLA11038; and LMM 63x Microscope Lens, P/N: 67215MFLA11050.

TABLE 4.2-5 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B REQUIREMENTS, APPENDIX P (9 PAGES)

CIRD Requirement Paragraph (SSP 50835)	CIRD Requirement	Payload Applica-bility	Verification Method	Verification Data Submittal	Required Submittal Date (L-X mos)	Comments

Key: Payload Applicability, A = Applicable, E = Exception, N/A = Not Applicable, NAR = Not a Requirement, A-N = Applicable with Note, NVR = No Verification Required.

Key: Verification Method, A = Analysis, D = Demonstration, I = Inspection, T = Test, NVR = No Verification Required, N/A = Not Applicable

Text Substitution Notes:

	For the following wording in SSP 50835:	Payloads substitute or add this wording:
1.	SSP 30558 and SSP 30559	SSP 52005
2.	VCB	PECP
3.	shall meet the specified performance requirements	shall maintain positive margins of safety
4.	shall meet the specified performance requirements	shall remain contained and not create a hazard
5.	shall operate properly	shall remain safe
6.	SSP 50021	NSTS 1700.7B/ISS
7.	shall meet the performance requirements specified herein	shall remain safe

The following additional requirement(s) will also need to be verified for the LMM BIO Kits, which contain an environmental monitor powered by a small battery that is connected during launch:

IRD Paragraph	IRD Requirement	Payload Applicability	Verifi-cation Method	Required Submittal Data	Submittal Date (L-X mos)	Comments
3. 2. 4. 4 / 4. 3. 2. 4. 4	Electromagnetic Interference		T&A	1. Test Report 2. Analysis report for the integrated rack based on subrack and/or rack equipment test data.	1. L-7.5 2. L-7.5	

Note: Verification of this additional requirement will allow transport in Shuttle only. Additional requirements for battery-powered items must be addressed prior to launch in other vehicles.

4.3 FIR CONFIGURATION LIST

The following tables contain subcomponents of the FIR which have been / will be verified for launch aboard MPLM and operation aboard the US Lab based on requirements in Table 4.2-1 above, and within the verification submissions for the FIR Rack part numbers listed in Table 4.3-1, FIR Rack Components, Table 4.3-2 Boeing Provided ARIS Hardware, Table 4.3-3, LMM/CVB Hardware, Table 4.3.1-1, HTV Transport Items, Table 4.3.2.1-1, LMM/PACE-2 Hardware, and Table 4.3.3-1 LMM-BIO.

The addition of the PACE and/or PACE-2 experiment does not create a configuration change for the FIR or LMM.

The addition of the LMM-BIO does not create a configuration change for the FIR or LMM.

FIR subcomponents listed in the tables below, launched separately from the integrated rack, can be verified for MPLM transport with the requirements in Table 4.2-2, and can be verified for Middeck transport with the requirements in Table 4.2-4. The subcomponents launched separately from the integrated rack will be launched as passive, soft-stowed items, and contain no batteries.

- MPLM/PMM requirements (MPLM) are shown in table 4.2-2.
- HTV requirements (HTV) are shown in table 4.2-3.
- Middeck requirements (MDK) are shown in table 4.2-4.
- Common launch requirements (CL) are shown in table 4.2-5.

The subcomponents listed in the tables below are integrated as part of one of the following configurations:

- 67213MFAF15500 = FLUIDS INTEGRATED RACK, LAUNCH CONFIGURATION
- 67213MFAF15600 = FLUIDS INTEGRATED RACK ON-ORBIT CONFIGURATION, CHECKOUT
- 67213MFAF15700 = FIR/LMM ON-ORBIT CONFIGURATION

TABLE 4.3-1 FIR RACK COMPONENTS

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
FCF I/O PROCESSOR	67211MFAB10300	MPLM
FCF EPCU	67211MFAG40010	MPLM
FCF IPSU- Analog	67211MFAB31100	MPLM
FIR White Light Power/Data Cable	67213EFAF30010	MPLM, CL
Fluids Science Avionics Package Assembly	67211MFAG40010	MPLM
FIR Avionics Package Power Cable	67213EFAF30001	MPLM
FIR IPSU Power/Data Cable #2	67213EFAF30018	MPLM
FIR Air Velocity Probe/SD Bracket	67211MFAD40010	MPLM
FIR Smoke Detector	67211MFAD40025	MPLM
FIR SD/Velocity Probe Launch Cover	67211MFAD40050	MPLM
FIR Air Velocity Probe Electronics	67211MFAD40017	MPLM
FIR LINT SCREEN ASSEMBLY - ATCU	67211MFAD10043	HTV
FIR Smoke Detector Cable	67213EFAF30015	MPLM
FCF I/O Processor Hard Disk Drive	67211EFAB10831	HTV, MPLM
FIR White Light Lamp	67213MFAL70750	HTV, MPLM
FIR 60 Degree Bench Stop	67213MFAF15620	MPLM
FIR Lamp Module Launch Bracket	67213MFAL70703	MPLM
FCF Door Plug Kit	67211MFKG10220	MPLM
SAMS TSH-ES	50000	MPLM
SAMS TSH-ES CABLE	50035	MPLM
WHITE LIGHT CHASSIS ASSEMBLY	67213MFAL70710	MPLM
White Light Fiber Optic Cable	67213MFAL70702	MPLM
FIR Optics Bench Front Port Cover Kit	67213MFKF15315	MPLM

TABLE 4.3-2 BOEING PROVIDED ARIS HARDWARE

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
ARIS STOWED KIT	683-61600-27	MPLM
ARIS Snubber Top - Left	683-61664-13	MPLM, MDK, ATV
ARIS Snubber Top - Right	683-61664-14	MPLM, MDK, ATV
ARIS Center Pin	683-61571-30	MPLM
ARIS Mod Temp TCS Supply	683-61634-3	MPLM
ARIS 1553A J3	683-61587-13	MPLM, MDK, ATV
ARIS Ethernet J46	683-61587-18	MPLM, MDK, ATV
ARIS 1553B J4	683-61587-14	MPLM, MDK, ATV
Actuator	683-61592-1	MPLM
Actuator	683-61592-2	MPLM
ARIS Ethernet J47	683-61587-19	MPLM, MDK, ATV
ARIS Video J16	683-61587-16	MPLM, MDK, ATV
ARIS Mod Temp TCS Return	683-61634-4	MPLM
ARIS Vacuum Exhaust	683-61634-2	MPLM, MDK, ATV
Pushrod	683-61599-7	MPLM
ARIS High Rate Data J7	683-61587-15	MPLM, MDK, ATV
ARIS FDS/Maintenance J43	683-61587-17	MPLM, MDK, ATV
ARIS Bridge Bracket R FWD	683-61571-37	MPLM
ARIS Bridge Bracket L FWD	683-61571-38	MPLM
Pushrod Attach V-Fitting	683-61615-13	MPLM
ARIS Pushrod Fitting	683-61615-12	MPLM
ARIS Cup Top - Right	683-61664-18	MPLM, MDK, ATV
ARIS Cup Top - Left	683-61664-17	MPLM, MDK, ATV
Alignment Guide	683-61667-2	MPLM
ARIS Snubber Bottom - Left	683-61664-19	MPLM
ARIS Cup Bottom - Left	683-61664-21	MPLM, MDK, ATV
ARIS Cup Bottom - Right	683-61664-22	MPLM, MDK, ATV
ARIS Main Power J1	1F15191-1	MPLM, MDK, ATV
ARIS Safing Power J2	1F15192-1	MPLM, MDK, ATV
ARIS Vacuum Resource Hose	1F15194-1	MPLM
ARIS Bridge Bracket R Rear	683-61571-35	MPLM, MDK, ATV
ARIS Snubber Bottom - Right	683-61664-20	MPLM
ARIS Bridge Bracket L Rear	683-61571-36	MPLM, MDK, ATV
ARIS Grounding Strap	683-61685-16	MPLM, MDK, ATV
ARIS GN2 Umbilical Looped	1F15193-1	MPLM, MDK, ATV

Note: The FIR ARIS Hardware is certified for MPLM Launch with the ARIS PIDS (S684–10158C).

TABLE 4.3-3 LMM/CVB HARDWARE (2 PAGES)

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
LMM Spindle Bracket Assembly	67215MEAB23816	MPLM, MDK
LMM Control Box	67215MEAB23700	MPLM, MDK
LMM Microscope	67215MEAB21000	MPLM, MDK
LMM Epi Diaphragm Module	67215MEAB24100	MPLM, MDK
Objective Revolver	67215MEAB23000	MPLM, MDK
LMM AFC	67215MEAB23200	MPLM, MDK
AFC Front Door	67215MEAB23213	MPLM, MDK
LMM Glove Port Plug	67215MEAB23221	MPLM, MDK
LMM Gloves	67235MFKB20123	MPLM
Door Panel, Right	67215MEAB23242	MPLM, MDK
Door Panel, Left	67215MEAB23211	MPLM, MDK
LMM X-Y Stage	67215MEAB21758	MPLM, MDK
CVB Cold Plate	67215MEAD40101	MPLM, MDK
LMM Latching Block Lower	67215MEAB23780	MPLM, MDK
LMM Latching Block Upper	67215MEAB23781	MPLM, MDK
LMM Epi-Light Pipe	67215MEAB20003	MPLM, MDK
LMM WIP Supply Hose	67215MEAB20081	MPLM, MDK
LMM WIP Return Hose	67215MEAB20082	MPLM, MDK
LMM Monochrome Camera 1	67215MEAB21031	MPLM, MDK
LMM Breather	67215MEAB23260	MPLM, MDK
CVB Surveillance Camera	67215MEAB23250	MPLM, MDK
LMM Control Box Power Cable	67215EEAB20021	MPLM, MDK
LMM Control Box Data/Video Cable	67215EEAB20022	MPLM, MDK
LMM Monochrome Confocal Video Cable	67215EEAB20023	MPLM, MDK
LMM AFC Surveillance Cable	67215EEAB20036	MPLM, MDK
LMM X-Y Stage Power/Data Cable	67215EEAB20024	MPLM, MDK
LMM Microscope Power/Data Cable 1	67215EEAB20028	MPLM, MDK
LMM Microscope Power/Data Cable 2	67215EEAB20029	MPLM, MDK
LMM Monochrome Video Cable	67215EEAB20032	MPLM, MDK
LMM AFC X-Y Stage Power/Data Cable	67215EEAB20035	MPLM, MDK
LMM Epi Diaphragm Cable	67215EEAB24105	MPLM, MDK
Optical Test Target	67215MFAB21779	MPLM, MDK
LMM Cleanup Kit	67215MEAB23600	HTV, MPLM, MDK
LMM Trans-Light Pipe	67215MEAB20005	MPLM, MDK
CVB Control Box	67215MEAD40020	MPLM, MDK
CVB FIR Data Cable	67215EEAB20020	MPLM, MDK
CVB Power/Data Cable	67215EEAB20038	MPLM, MDK
CVB Module Power/Data Cable	67215EEAB20039	MPLM, MDK

TABLE 4.3-3 LMM/CVB HARDWARE (2 PAGES)

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
CVB Module - Dry	67215MEAD40114	MPLM, MDK
CVB Module - 40 mm Pentane	67215MEAD40115	MPLM, MDK
CVB Module - 30 mm Pentane	67215MEAD40116	MPLM, MDK
CVB Module - 20 mm Pentane	67215MEAD40118	MPLM, MDK
CVB Module - 30 mm Ethanol	67215MEAD40116	MPLM, MDK
CVB Module - 20 mm Ethanol	67215MEAD40118	MPLM, MDK
CVB Kit	67215MEAB23400	MPLM, MDK
LMM Cable Tie Down	67215MEAB20113	MPLM, MDK
LMM Fastener Tool	67215MEAD40245	MPLM, MDK
LMM Objective Lens Kit	67215MFLA11041	MPLM, MDK
LMM 10x Lens	67215MFLA11035	CL
LMM 20x Lens	67215MFLA11036	CL
LMM 50x Lens	67215MFLA11038	MPLM, CL
LMM 63x Microscope Lens	67215MFLA11050	MPLM, CL
LMM Misc. Kit	67215MFAL11049	MPLM, MDK

4.3.1 HTV TRANSPORT

The payload equipment listed in Table 4.3.1-1, HTV Transport Items, are launched soft-stowed in the HTV. The HTV launch requirements for these items are in Table 4.2-3, HTV Applicability/Verification Matrix. Table 4.2-1 contains the requirements for operations in the US Lab.

TABLE 4.3.1-1 HTV TRANSPORT ITEMS

Part Name	Part Number	Description
LAMP MODULE ASSEMBLY	67213MFAL70750	The FIR Lamp Module is a fully contained illumination ORU use within the FIR to provide illumination for the FIR Imaging Diagnostics. This unit will be replaced semi-regularly. The Assembly is comprised of an Aluminum Housing with copper wiring and a glass light bulb containing mercury vapor.
FIR LINT SCREEN ASSEMBLY - ATCU	67211MFAD10043	The Fluids Integrated Rack (FIR) multi-user facility that is installed within the US Lab for the purposes of conducting Fluid Science Investigations. This hardware component is a replaceable filter for the internal thermal air exchange fans.
FIOP REMOVABLE HARD DRIVE CARRIER ASSEMBLY	67211EFAB10831	The FCF I/O Processor Hard Disk Drive are 180 Gigabyte hard drive assemblies. The assemblies are packaged for crew handling and simple installation and removal from the I/O Processor. The hard drive is configured with an operating system and application software required to operate the CIR. The remaining disk space is dedicated to on-orbit recording and storage the telemetry and image files generated during CIR science operations.
CLEAN-UP ETM ASSEMBLY	67215MEAB23600	The LMM Cleanup Kit will be used by LMM when necessary to remove from the FIR rack an improperly functioning science module. This Cleanup Kit will provide complete containment so that LMM science module can be clean and evacuated prior to stowage. The Kit is comprised of an iridited Aluminum Housing with aluminum mesh screen and lexan window.

4.3.2 PACE EXPERIMENT

The Preliminary Advanced Colloids Experiment (PACE) is contained within the LMM Glovebox. Figure 4.3.2-1 shows the PACE.

Table 4.3.2-1 provides the parts contained in the PACE experiment.

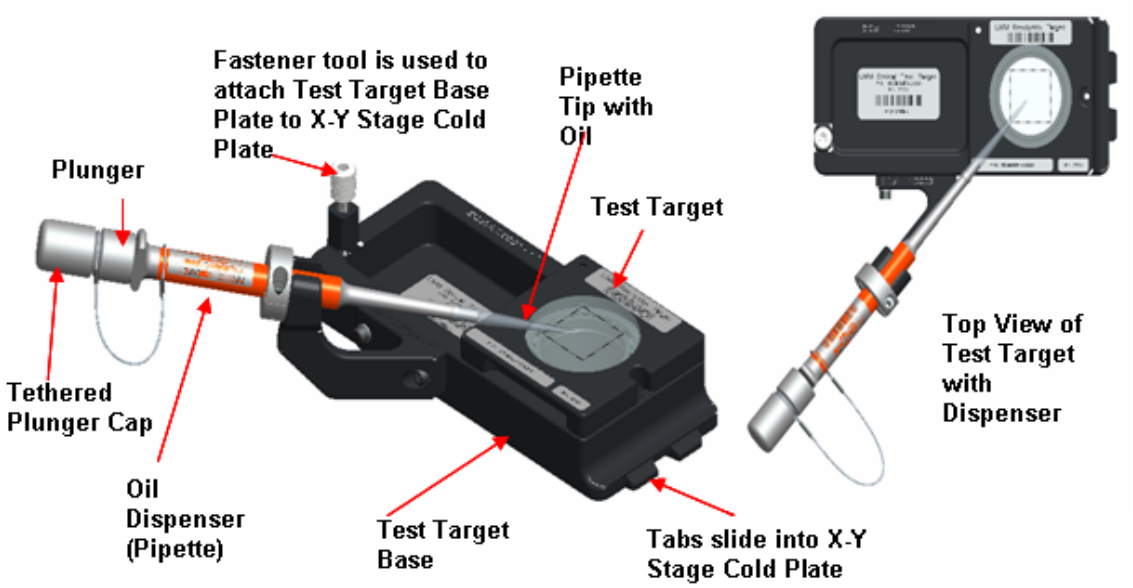

FIGURE 4.3.2-1 PACE EXPERIMENT

TABLE 4.3.2-1 LMM/PACE HARDWARE

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
PACE Test Target	S1051MFA0000	MPLM
PACE Oil Dispenser	S1051MFA0009	MPLM

Note 1: PACE is a small metal target which goes inside the LMM Glovebox exactly like CVB. The addition of PACE does not create a configuration change for the LMM or FIR.
Note 2: PACE on-orbit requirements are listed in Table 4.2-1 and are verified as part of the Integrated Rack. Transport requirements must be addressed for the PACE and are listed in Table 4.2-2.
Note 3: The PACE Oil Dispenser is launched sealed and preloaded with silicone oil. The crew mounts the PACE Oil Dispenser to the PACE hardware only when fully contained and sealed within LMM's glovebox. The crew then, using the gloves of the glovebox dispenses the oil onto the test target.
Note 4: The PACE Oil Dispenser is manifested on HTV-2 as resupply. Transport requirements must be addressed for the PACE Oil Dispenser and are listed in Table 4.2-5.

4.3.2.1 PACE-2 EXPERIMENT

The Preliminary Advanced Colloids Experiment - 2 (PACE-2) will utilize the same hardware as PACE found in Table 4.3.2-1. PACE-2 adds the unique hardware listed in Table 4.3.2.1-1.

TABLE 4.3.2.1-1 LMM/PACE-2 UNIQUE HARDWARE

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
PACE Particle Sample	S1051MFA0023	CL
PACE Tissue Cell	S1051MFA0018	CL

Note 1: PACE-2 on-orbit requirements are listed in Table 4.2-1 and are verified as part of the Integrated Rack. Transport requirements must be addressed for PACE-2 and are listed in Table 4.2-5.

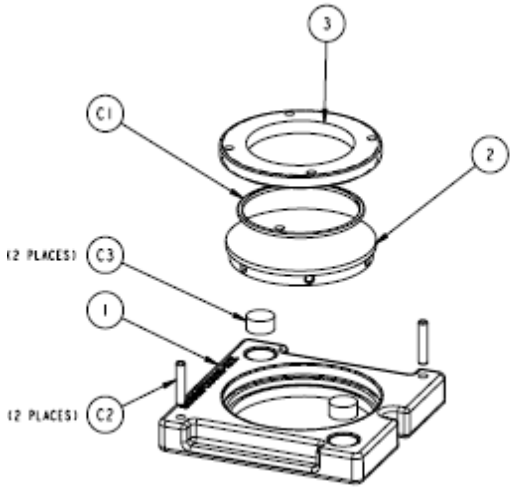

FIGURE 4.3.2.1-1 PACE PARTICLE SAMPLE

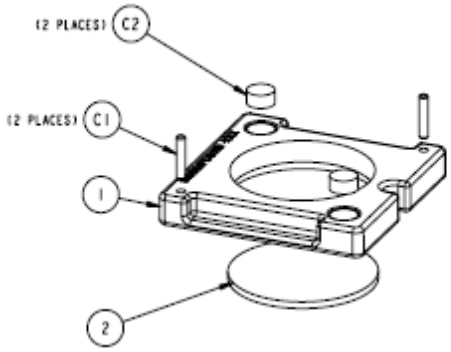

FIGURE 4.3.2.1-2 PACE TISSUE CELL

4.3.3 LMM-BIO EXPERIMENT

The LMM-BIO is contained within the LMM Glovebox. The LMM-BIO Experiment uses the existing LMM hardware to analyze a culture system.

LMM-BIO will utilize the FIR on-orbit verification matrix provided in Table 4.3-1 and utilize the Common Transport Requirements in Table 4.2-5.

Figure 4.3.3-1 shows the LMM BIO OPTI-Cell Culture System.

Figure 4.3.3-2 shows the LMM BIO Worm Kit or Liver Tissue Kit. These kits utilize a refurbished CVB Kit. The kits are identical except for the contents of the OPTI-Cell cultures.

LMM-BIO will test a series of biological sample cells installed in the LMM and determine the biologically relevant resolution of appropriate synthetic beads containing various sizes, colors and florescence (excited using blue LEDs), microbes, tissue culture cells, small organisms and tissue sections that have been fixed on a slide, and six sets of living C. elegans (worms).

Table 4.3.3-1 provides the parts contained in the BIO experiment.

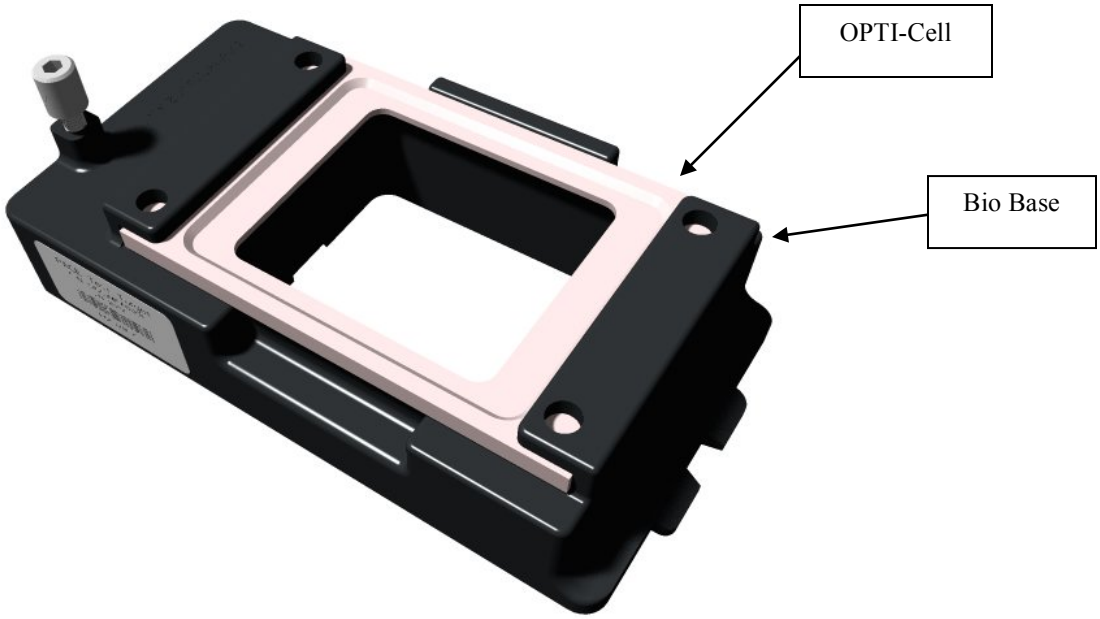

FIGURE 4.3.3-1 LMM-BIO EXPERIMENT

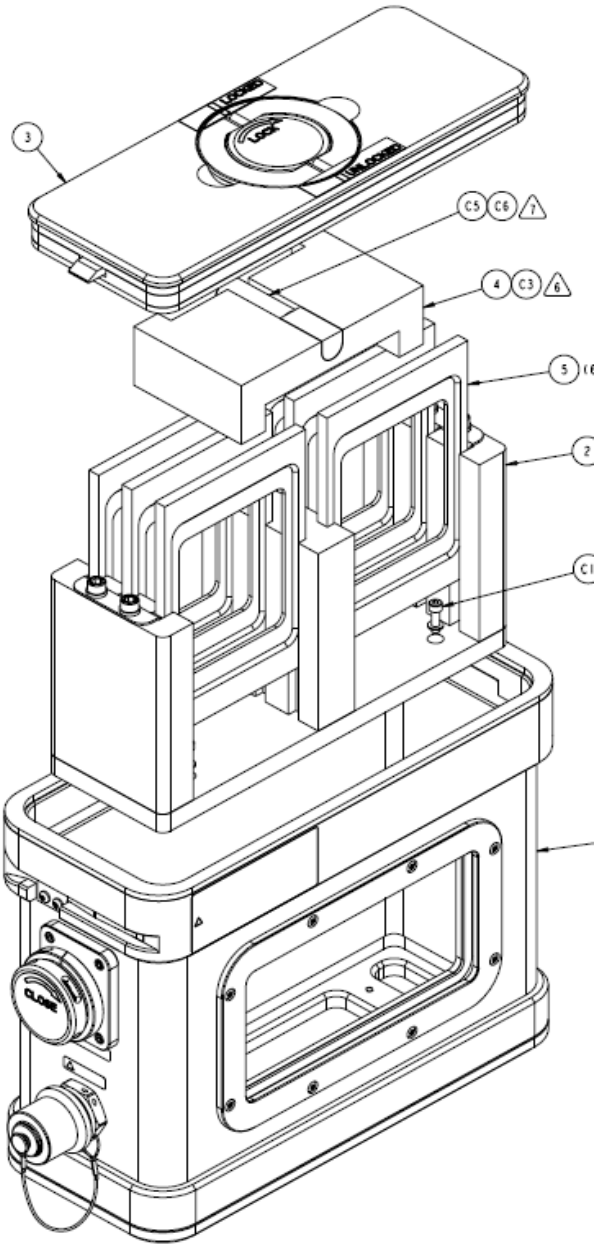

FIGURE 4.3.3-2 BIO WORM KIT OR BIO LIVER TISSUE KIT

TABLE 4.3.3-1 LMM-BIO HARDWARE

PART NAME	PART NUMBER	CARRIER COMPATIBILITY
Bio Worm Kit	S1051MFA0030	CL
Bio Liver Tissue Kit	S1051MFA0050	CL
Bio Base[2]	S1051MFA0025	CL

Note 1: The LMM Bio Kits contain an environmental monitor powered by a small battery.
Note 2: The Bio Base is launched separately from the Bio Worm Kit and/or Bio Liver Tissue Kit

5.0 EXCEPTIONS, DEVIATIONS AND WAIVERS

5.1 EXCEPTIONS TABLE

A summary description and rationale is provided in Table 5.1-1 for each exception to an IRD requirement identified in Table 4.2-1.

TABLE 5.1-1 EXCEPTIONS (2 PAGES)

IRD PARAGRAPH NUMBER	EXCEPTION NUMBER	EXCEPTION TITLE	APPROVAL STATUS
3.1.1.1.A	57217-NA-0035A	FCF CIR/FIR GSE Interface Exception	Approved
3.1.1.3.D	57217-NA-0036B	FCF CIR/FIR Rack Door Crew Induced Loads Exception	Approved
3.1.1.3.D	57218-NA-0014	LMM Crew Induced Loads Exception	Approved
3.1.1.3.D	57218-NA-0010	FIR Crew Induced Loads Exception	Approved
3.1.1.4.A	57227-NA-0008	Rack Shipping Container Heavy Rack Exception	Approved
3.1.1.4.A	57218-NA-0008	FIR Mass Exception	Approved
3.1.1.4.E	57217-NA-0039	FCF CIR and FIR Rack Pivot Mechanism Keepout Zone Exception	Approved
3.1.1.7.A	57217-NA-0029B	Rack−to−Rack Cabling	Approved
3.1.1.7.1	57217-NA-0033	FCF CIR/FIR On-Orbit Permanent Protrusion Exception	Approved
3.1.1.7.3.A	57218-NA-0001B	Exception for FIR On-Orbit Temporary Protrusion	Approved
3.1.1.7.3.A	57218-NA-0019A	FIR Door On-Orbit Temporary Protrusion Exception for Stage 17A up to Rack Relocation During Stage 20A in the US Lab	Approved
3.1.1.7.3.A	57218-NA-0031A	Effectivity Extension of FIR Door On-Orbit Temporary Protrusion Exception 57218-NA-0019A	Approved
3.2.2.4	57218-NA-0020A	EPCU Exception to the Surge Current Requirements	Approved
3.2.2.6.2.1.1	57217-NA-0045	EPCU Exception to the RPC Trip Coordination Requirements	Approved
3.2.2.8	57217-NA-0009	CIR−EPCU Exception to Large Signal Stability Testing Requirements	Approved
3.2.3.1.C	57202-NA-0017A	ARIS Wire Rating Exception for All US Lab Rack Locations	approved

TABLE 5.1-1 EXCEPTIONS (2 PAGES)

IRD PARAGRAPH NUMBER	EXCEPTION NUMBER	EXCEPTION TITLE	APPROVAL STATUS
3.2.3.1.C	57217-NA-0027	FCF Ground Wire Derating	Approved
3.2.4.1	57217-NA-0032	FCF I/O Processor Signal Isolation Exception	Approved
3.2.4.2	57217-NA-0012	FCF Water Flow ControlAssemblyException to Bonding Requirements	Approved
3.2.4.3	57218-NA-0021	FCF FIR Exception to the Cable/Wire Design Requirement	Approved
3.2.4.4	57218-NA-0015A	FIR EPCU Exception to the EMI RS03 Requirements	
3.2.4.4	57218-NA-0016A	FIR LMM Exception to the EMI RE02 Requirements	Approved
3.2.4.4	57217-NA-0017A	CIR and FIR EPCU Exception to the EMI CE07 Conducted Emission Requirements	Approved
3.2.4.4	57218-NA-0018	FIR Velocity Probe and Probe Electronics Exception to the EMI CS02 & RS03 Requirements	Approved
3.2.4.4	57218-NA-0035	FIR WLCA Exception to the EMI RE02 Requirements	Approved
3.2.4.5	57218-NA-0009A	Fluid Integrated Rack (FIR) Exception to the ESD Testing Requirement	Approved
3.2.4.7	57218-NA-0013	ARIS Actuators Exception to Direct Current (DC) Magnetic Field Requirement	Approved
3.3.10.2.4	57217-NA-0041A	FCF CIR/FIR Fan Ventilation Status Electrical Interface Exception	Approved
3.5.1.6.A, 3.5.1.6.B	57218-NA-0002A	FIR Moderate Temperature Loop (MTL) Coolant Return Temperature Exception	Approved
3.7.1.4	57202-NA-0033B	GN2 Umbilical Leakage Exception for Integrated Racks that use ARIS Umbilicals	Approved
3.9.1.3	57218-NA-0012	FIR LMM Humidity Exception	Approved
3.12.3.3.1.B	57218-NA-0017A	FIR Continuous Noise Limits Exception	Approved
3.12.4.3.3.B	57217-NA-0006A	CIR & FIR Ease of Disconnect (Number of Connector Turns to Disconnect)	Approved
3.12.4.3.6.A	57218-NA-0003	FIR White Light Module Fiber Optic Connector Arrangement Exception	Approved

APPENDIX A
ABBREVIATIONS AND ACRONYMS

A	Applicable
AC or ac	Alternating Current
AFC	Aux Fluids Container
AMA	Atmospheric Monitoring Assembly
amps	Amperes
APM	Attached Pressurized Module
APS	Automated Payload Switch
Ar	Argon
ARIS	Active Rack Isolation System
ARPC	Auxiliary Remote Power Controller
ATCU	Air Thermal Control Unit
ATV	Automated Transfer Vehicle
AUX	Auxiliary
BPDU	Bitstream Protocol Data Unit
C	Centigrade
C&DH	Command & Data Handling
C&W	Caution & Warning
CAM	Centrifuge Accommodations Module
CCCD	Cargo Configuration Control Drawing
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
CG or cg	Center of Gravity
CIR	Combustion Integrated Rack
CL	Common Launch
CO_2	Carbon Dioxide
COC	Certificate of Compliance
COF	Columbus Orbiting Facility
CSMA/CD	Carrier Sense multiple Access with Collision Detection

CTB	Cargo Transfer Bag
CVB	Constrained Vapor Bubble
dB	deciBel
dBm	deciBels Referenced to One Milliwatt
dc	Direct Current
DCM	Diagnostics Control Module
DDCU	DC to DC Converter Unit
ECS	Environmental Control System
EEE	Electrical, Electronic, and Electromechanical
EMC CS-01, 02	Electromagnetic Compatibility; Conducted Susceptibility -01 (CS-01), Conducted Susceptibility -02 (CS-02)
EME	Electromagnetic Effects
EMI	Electromagnetic Interference
EPCE	Electrical Power Consuming Equipment
EPCU	Electrical Power Control Unit
EPS	Electrical Power System
ESA	European Space Agency
EVA	Extra Vehicular Activity
EWACS	Emergency Warning and Caution System
F	Fahrenheit
FCF	Fluids and Combustion Facility
FDC	Federal Data Corporation
FDSS	Fire Detection and Suppression System
FEM	Finite Element Model
FIR	Fluids Integrated Rack
FRPC	Flexible Remote Power Controller
FSS	Fluid System Servicer
FWHM	Full Width Half Maximum
Gal	gallon

GFCI	Ground Fault Circuit Interrupter
GIS	Gas Interface System
GIU	Ground Integration Unit
GN_2	Gaseous Nitrogen
GRC	Glenn Research Center
GSE	Ground Support Equipment
He	Helium
hr	hour
HRDL	High Rate Data Link
HRFM	High Rate Frame Multiplexer
HTV	H-II Transfer Vehicle
Hz	Hertz
I	Inspection
ICD	Interface Control Document
IDD	Interface Design Document
IEC	International Electro Technical Commission
IEEE	Institute of Electrical and Electronic Engineers
I/F	Interface
in	inch
I/O	Input/output
IOP	Input/Output Processor
IPSU	Image Processing and Storage Unit
IRD	Interface Requirements Document (SSP 57000)
ISO	International Standards Organization
ISPR	International Standard Payload Rack
ISS	International Space Station
ITCS	Internal Thermal Control System
JAXA	Japan Aerospace Exploration Agency
JEM	Japanese Experiment Module

JSC	Johnson Space Center
kg	kilograms
kHz	kiloHertz
kPa	kiloPascal
KSC	Kennedy Space Center
kW	kiloWatt
L	Launch
LAN	Local Area Network
lbm	pounds mass
lbs	pounds
LED	Light Emitting Diode
LIS	Lead Increment Scientist
LMM	Light Microscopy
LRDL	Low Rate Data Link
LSB	Least Significant Bit
LTL	Low Temperature Loop
m^3	Cubic Meter
mA	milliAmperes
max	maximum
mbar	millibar
MDM	Multiplexer-Demultiplexer
MDK	Middeck
MDP	Maximum Design Pressure
mg	milligram
MIL-STD	Military Standard
min	minimum
mm	millimeter
MO	Mission Operations
mos.	months

MPLM	Mini Pressurized Logistics Module
MRDL	Medium Rate Data Link (Ethernet)
MSB	Most Significant Bit
MSD	Microgravity Sciences Division
msec	
MSFC	Marshall Space Flight Center
MTL	Moderate Temperature Loop
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
ND	Neodydium
NSTS	National Space Transportation System
NTSC	National Television Systems Committee
NVR	
OOS	Onboard Operations Summary
ORU	Orbital Replacement Unit
Pa	Pascal
PACE	Preliminary Advanced Colloids Experiment
PCS	Portable Computer System
PEHG	Payload Ethernet Hub Gateway
PFE	Portable Fire Extinguisher
PFM	Pulse Frequency Modulation
PI	Principal Investigator
PIA	Payload Interface Agreement
PIMS	Payload Information Management System
PIRN	Preliminary/Proposed Interface Revision Notice
PL	Payload
PN	Part Number
POIC	Payload Operations and Integration Center
psia	pounds per square inch absolute

psid	pounds per square inch differential
PSRP	Payload Safety Review Panel
PTCS	Payload Test and Checkout System
PVP	Payload Verification Plan
QD	Quick Disconnect
R/FR	Refrigerator/Freezer
Rev	Revision
RFCA	Rack Flow Control Assembly
RHA	Rack Handling Adapter
RID	Rack Insertion Device
RPC	Remote Power Controller
RSC	Rack Shipping Container
RT	Remote Terminal
RUP	Rack Utility Panel
SAMS	Space Acceleration Measurement System
SAR	Shared Accommodations Rack
SDL	Serial Data Link
sec	second
SEE	Single Event Effect
SI	International System of Units
SLPM	Standard Liters per Minute
SPL	Sound pressure Level
SSC	Station Support Computer
SSP	Space Station/Shuttle Program
SSPC	Solid State Power Controller
SSPF	Space Station Processing Facility
SSQ	Space Station Qualified
STP	Short-Term Plan
SUP	Standard Utility Panel

T	Test
T&A&I	Test & Analysis & Inspection
TBC	To Be Confirmed
TBD	To Be Determined
TBE	Teledyne Brown Engineering
TBR	To be Resolved
TCS	Thermal Control System
TSC	Telescience Support Center
TSH	Triaxial Sensor Head
UIP	Utility Interface Panel
UOP	Utility Outlet Panel
US	United States
USL	United States Laboratory
VDC or Vdc	Volts Direct Current
VES	Vacuum Exhaust System
VRS	Vacuum Resource System
VTR	Video Tape Recorder
VVS	Vacuum Vent System
W	watt
WFCA	Water Flow Control Assembly
WGS	Waste Gas System
WIP	Water Interface Panel
WTCS	Water Thermal Control System
YAG	Yttrium Aluminum Garnet

APPENDIX B
GLOSSARY OF TERMS

Access Port: Hole that allows penetration of the Portable Fire Extinguisher nozzle

Active Air Exchange: Forced convection between two volumes. For example, forced convection between a subrack payload and the internal volume of an integrated rack, or forced convection between a subrack payload and the cabin air.

Exception: Uniquely defined for Payloads Processes; refer to Section 5.1 of this document.

Non-Normal: Pertaining to performance of the Electrical Power System outside the nominal design due to ISS system equipment failure, fault clearing, or overload conditions.

Operate: Perform intended design functions given specified conditions.

Rack Maintenance Switch: The switch that controls power to the rack.

Safety-Critical: Having the potential to be hazardous to the safety of hardware, software, and/or personnel.

APPENDIX C
TO BE DETERMINED/TO BE RESOLVED

C.1 PURPOSE AND SCOPE

The purpose of this appendix is to identify the open items from Sections 3.0 and 4.0 of this document.

C.2 TO BE DETERMINED ITEMS

Table C-1 provides a list of items from Section 3.0 that are identified as To Be Determined (TBD). The organization responsible for providing the missing data and the due date for the missing data is also provided.

TABLE C-1 TO BE DETERMINED ITEMS

TBD No.	Description	Document Section	Responsible	Due Date

C.3 TO BE RESOLVED ITEMS

Table C-2 provides a list of items from Section 3.0 that are identified as To Be Resolved (TBR) items. The organization responsible for supplying the data is also provided.

TABLE C-2 TO BE RESOLVED ITEMS

TBR No.	Description	Document Section	Responsible	Due Date

APPENDIX D
REQUIRED SUBMITTAL DATA AND SAMPLE FORMS

The results of verification activities shall be documented. All supporting documentation will be retained and provided by the PD upon request. Data that are required to be submitted will be identified in Table 4.2-1 Applicability/Verification Matrix. Data submittals specified herein do not relieve the PD from reports required to support program and design reviews. The three categories of submittal data are defined below, and Table 4.2-1 will identify which category is acceptable to demonstrate compliance with the verification requirement. The PD is required to indicate on each of the following forms the Stage Effectivity (i.e., 5A.1, 6A, 7A, etc.) for each verification closure submittal.

(1) Certificate of Compliance

A Certificate of Compliance (COC) is a memorandum from a PD certifying that the hardware and/or software comply with the applicable IRD requirement. Multiple IRD requirements may be combined on a single COC. It should also state that the supporting data will be maintained by the PD and provided upon request. A COC can be used to address analysis, test, inspection, and demonstration verification methods. An example follows.

(2) Data Certification

A Data Certification is a memorandum from a PD certifying that the requirements identified in Table 4.2-1 Applicability/Verification Matrix have been met and providing the required summary results. It should also state that the supporting data will be maintained by the PD and provided upon request. The Data Certification will provide the following information:

- Identification of all IRD requirements being addressed by the data certification.
- Statement of fact concerning the completion of the applicable analysis or test.
- Completion date of the analysis or test.
- Identification of the report containing the result of the analysis or test (i.e., Title and Number).
- Summary statement including the results of the analysis or test (e.g., margins of safety summary table or an isolation measurement).

An example follows.

(3) Detailed Data

Detailed analysis and test data per the data required section of Table 4.2-1 Applicability/ Verification Matrix. An example follows:

HARDWARE CERTIFICATE OF COMPLIANCE (COC)

I hereby certify compliance with the verification requirements as specified in _____. I also certify that the identified as-built hardware, per the current applicable Engineering Configuration List, was manufactured in accordance with the design drawings, parts lists, applicable waivers and deviations. All supporting data is valid, applicable, and complete. This data is maintained in our files and will be made available upon request.

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable state in the Stage Effectivity block shown on this form.

Payload	Stage Effectivity	VDS Number	Method	Applicable Document Rev. Date	Drawings, Parts Lists, Waivers, Deviations, Procedures, Etc. (Attach correlated list as needed)

_____
Print Name/Signature/Date
Payload Developer Responsible Person

Organization

DATA CERTIFICATION

I hereby certify compliance with the verification requirements as specified in _____. I also certify that the identified as-built hardware, per the current applicable Engineering Configuration List, was manufactured in accordance with the design drawings, parts lists, applicable waivers and deviations. All supporting data is valid, applicable, and complete. This data is maintained in our files and will be made available upon request.

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable state in the Stage Effectivity block shown on this form.

Payload	Stage Effectivity	VDS Number	Method	Applicable Document Rev. Date	Summary (attach sheets as needed)

_____
Print Name/Signature/Date
Payload Developer Responsible Person

Organization

VERIFICATION ANALYSIS REPORT

Payload:	Stage Effectivity:	Analyst:	Configuration analyzed:	Date:
1. Objective of the Analysis:				
2. Requirements Satisfied:				
3. Description of Analytical Technique:				
4. Analysis Input Data (Summary):				
5. Technical Results:				
6. Conclusions:				
7. Signature and Organization:				

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable stage in the Stage Effectivity block on this form.

VERIFICATION TEST REPORT

Payload:	Stage Effectivity:	Test Engineer:	Test Procedure Used:	Date:
1. Item Tested (Name, Serial Number, Part Number):				
2. Objectives of the Test:				
3. Description of Test Setup:				
4. Test Results Summary:				
5. Correlation of Test Sequence to Verification Requirements:				
6. Explanation of all Failures and Corrective Action Taken during the Test:				
7. Signature and Organization:			8. Quality Assurance:	

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable stage in the Stage Effectivity block on this form.